EVALUATING THE EFFECTS OF THE DESIGN-BID-BUILD (DBB) DELIVERY METHOD ON MUNICIPAL PROJECTS IN SAUDI ARABIA

BY

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بسم الله الرحمن الرحيم

DEDICATION

In the name of Allah, the most Gracious, the most Merciful.

"…Allah will exalt those who believe among you, and those who have knowledge, to high ranks…"

Holy Qur'an Chapter 58: Almujadilah -11.

This thesis is dedicated firstly to Almighty Allah,

"… Who taught by the pen, Taught man what he knew not…"

Holy Qur'an Chapter 96: Al-'Alaq — The Clot: 4-5

I would like to further dedicate this thesis to my beloved father, Mohammed and my beloved mother, Mona, for their continuous encouragement and prayers.

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THESIS ABSTRACT – ENGLISH

Name: Ahmed Mohammed Aburas

Title: Evaluating the Effects of the Design-Bid-Build Delivery Method on Municipal Projects in Saudi Arabia

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Municipal (Amanah) projects are service projects initiated to address the needs of cities in order to resolve current problems, address new demands, or support future visions. Historically, the Design-Bid-Build (DBB) delivery method has been used extensively in the undertaking of Saudi municipal projects, regardless of circumstances. This research study investigated the effects of this delivery method on the three objective project performance criteria: cost, time and quality. An empirical study was conducted using data from fourteen (14) of the country's sixteen (16) Amanahs. The study revealed that in more than 64% of Amanah projects, cost, time and quality performance criteria have not been met as projected. Regarding project cost, the bureaucracy of government systems, price inflation of construction materials and poorly-developed plans and specifications emerged as the chief factors leading to project cost overrun. Among the factors that were found to contribute to the failure of a project to meet the planned construction deadlines were change orders, the need for corrective work, major changes to the original design requested by the Amanahs and poorly-developed project plans and specifications. The Amanahs' failure to achieve the desired quality standards for projects can be attributed to the sub-standard qualifications of many contractors, poorly-developed project plans and specifications and the inadequate supervision of projects. A number of recommendations are proposed for consideration by the Ministry of Municipal and Rural Affairs (MOMRA) and the Amanahs. These include: the reviewing of contractor classification criteria, closer monitoring of capabilities and capacities of contractors prior to the awarding of new projects, and the need for greater flexibility in the choice of project delivery method.

THESIS ABSTRACT – ARABIC

الاسم : أحمد محمد أبوراس

عنوان الرسالة : تقييم تأثير الطريقة التقليدية للتعاطي في المشاريع "التصميم-العطاء-التشييد" على المشاريع البلدية في المملكة العربية السعودية
التخصص : إدارة وهندسة التشييد
التاريخ : ديسمبر، 2012

المشاريع البلدية هي مشاريع خدمية تلبي احتياجات المدن وذلك حلاً لمشاكلها الراهنة، واستجابة لاحتياجاتها المستحدثة، او دعماً لرؤاها المستقبلية. فقد استخدمت طريقة "التصميم-العطاء-البناء" للتعاطي مع المشاريع والتي يطلق عليها أيضاً اسم "الطريقة التقليدية" في تنفيذ المشاريع البلدية على نطاق واسع ، بغض النظر عن الظروف المحيطة بطبيعة كل مشروع. فهذه الطريقة تفصل بين مرحلة التصميم وأنشطة التشييد خلال دورة إتمام المشروع. وعليه فإن هذه الدراسة تبحث عن تأثير هذة الطريقة التقليدية على ثلاثة محاور رئيسة لتقييم معايير نجاح أداء اي مشروع وهي التكلفة والوقت والجودة. فقد شملت هذه الدراسة 14 أربعة عشر أمانة بالمملكة العربية السعودية. وقد استخلص من نتاج هذه الدراسة ان أكثر من 64% من مشاريع الأمانات لم تنجز في غضون الفترة المحددة لها وكذلك تجاوزت الميزانية المرصودة لها ولم تستوف المواصفات المخططة لها. فقد يعزى هذا القصور إلى عدد من الأسباب، بما فيها أسلوب تعاطي المشاريع المستخدم حالياً وكذلك مؤهلات المقاولين وغيرها من أسباب أخرى.

فيما يتعلق بتكلفة المشروع، فإن بيروقراطية الأنظمة الحكومية وتضخم أسعار مواد البناء، وسوء إعداد الخرائط والمواصفات للمشروع لها الدور الرئيس في تجاوز التكلفة المحددة. وثمة عوامل أخرى تسهم في تأخر إنجاز المشروع عن الوقت المخطط له ومن بينها كثرة أوامر التغيير أثناء التشييد، الحاجة إلى أعمال تصحيحية، التغييرات الرئيسة في التصميم الأصلي والمتفق عليه مع الأمانة وكذلك سوء إعداد الخرائط والمواصفات للمشروع. أما فشل الأمانات في الحصول على الجودة المطلوبة فمرده إلى مؤهلات المقاولين وسوء إعداد الخرائط والمواصفات للمشروع وغياب الإشراف الجيد على المشاريع من قبل اجهزة الإشراف بالأمانات. وأخيراً، فهناك عدد من التوصيات و المقترحات لعناية وزارة الشئون البلدية و القروية والأمانات. فقد شملت هذة الاقتراحات إعادة النظر في معايير تصنيف المقاولين، رصد قدرات وإمكانات المقاولين المتعاقدين قبيل منحهم مشاريع إضافية جديدة، فضلاً عن الحاجة إلى تجربة طرق أخرى للتعاطي مع المشاريع لضمان أكبر قدر من المرونة في المشاريع.

CHAPTER 1: INTRODUCTION

The construction industry in Saudi Arabia is one of the country's largest industries, alongside oil and gas, and exerts a major influence on the national economy. The sector continues to contribute, with an increasing trend, to an average annual growth rate of 4.9% and was worth SR 58.8 billion in fiscal 2008. This is equivalent to almost 6.9% of the country's Gross Domestic Product (GDP) for that year (MOE&P, 9th DP).

In the construction sector, quality assurance, cost compliance and completion time are very important for all parties involved in the construction of any facility or infrastructure and service project. These concerns are impacted by many factors, one of which is the project delivery method (Al Khalil, 2002). Different project delivery methods are currently available and could be utilized when pursuing construction projects provided that certain conditions are met. Such conditions are defined by, inter alia: the complexity and uniqueness of the project, the clarity of scope, the completeness of plans and specifications, the urgency of project completion, the available in-house technical capabilities, the nature of the projects, the technology requirements, the risk mitigation, and the availability of competent general contractors. In the final analysis, it is the owner or client that makes the decision with regard to the project delivery method to be employed (Moore, 2000).

Although there are usually governmental mandates and contractual arrangements and guidelines to be followed for almost all types of governmental projects kingdom-wide, this research study is focused solely on municipal construction projects in Saudi Arabia.

1. 1. Statement of the Problem

Despite the significance of municipal construction projects and the importance of selecting an optimal project delivery method, it would appear that inadequate attention is being paid to the selection of an optimal project delivery method. The municipalities always follow the government purchasing regulations, which essentially mandate the use of the design-bid-build (DBB) "traditional" delivery model for all projects, regardless of circumstances. This approach results in several contractual agreements being entered into with independent entities to request government funding for a project or for the actual execution of a project. For this execution to begin, an architectural and engineering firm (A/E) is hired to prepare the architectural and engineering documents, including detailed plans, specifications, and bidding documents for a project. The package is then opened to competitive bidding under government rules and guidelines and, finally, construction activities are initiated by the selected general contractor (GC) and subcontractors. The current feeling reported verbally by municipality officials around the country is that most of the projects suffer from cost overrun, delays and quality problems. The real challenge faced when using this traditional approach is to complete the project while meeting the three performance measures of cost, time and quality. However, alternative delivery methods could be used if government procedures allowed for their implementation.

The above situation gives rise to the need to know how the involved parties may come to a workable agreement that fulfills their expectations. What are the implications of current practices and how can outcomes be improved in terms of time, cost, and quality? Also,

what are the major factors that are taken into consideration when making selection decisions?

1. 2. Objectives

The main objectives of this research study can be summarized as follows:

1. To determine the problems which municipalities encounter during the development of their building projects, from the initiation stage through to project completion.
2. To evaluate the effects of the DBB delivery method on the cost, time and quality criteria for municipal projects.
3. To suggest appropriate delivery methods which municipalities could use in order to more effectively achieve their project objectives.

1. 3. Significance of the Study

Municipalities, being government agencies, use the DBB delivery method. This study will attempt to determine the problems which municipalities encounter during the development of their building projects, from the initiation stage through to project completion. It will also investigate the most appropriate delivery methods which municipalities could use to achieve their project objectives. Thus, the study may confirm the existing conclusions of other research findings.

However, the variety of choices this potentially creates for the stakeholder can be negative as well as positive. As far as the former is concerned, the problem is that variety can cause confusion. Moreover, competing claims of the advisability of one method over

its rivals will be distracting. Nonetheless, the plus side is that an increased number of alternatives will allow for greater flexibility. The stakeholder therefore has an opportunity to select the most suitable system for the project under consideration (CMAA, 2010).

Advocates of alternative delivery methods assure enhancement over the traditional system in terms of cost, project control and a reduction in the number of disputes as well as in terms of constructability.

Evidently, there is no one right project delivery method for a given project. All delivery methods have been used productively and all have limitations. Considerations that should guide the client or the owner in selecting the optimal project delivery method include: project type and size, available budget, client in-house capabilities, potential design changes, and the urgency of completing the project. The optimum project delivery method is one that best translates client or owner vision into a physical structure. These decisions have to be made considering different factors or criteria that contribute to the success of a construction project. The importance of such selection stems from the three functions it serves:

1. To define all the contractual agreements and relationships, roles and responsibilities of stakeholders embarked upon a project.
2. To consider the conditions surrounding a project in order to facilitate the translation of owner or client vision into a physical structure or building.
3. To positively impact project quality, cost containment, completion time and contractual agreements and relationships.

This research study is significant because it delineates the selection criteria needed to assist decision-makers in selecting the optimum delivery method for projects in the construction sector.

Furthermore, parties involved in municipal project construction, as with any other type of construction, need to have mutually understood expectations regarding important issues such as quality, cost, completion time and contractual agreements. Without this mutual understanding, there will be a great potential for disputes, delays, or quality issues. Thus, the investigation of current decision-making practices and how they satisfy the above need is essential. If this need is not satisfied by current practices, it is important to develop some kind of system in order to satisfy it.

This research study will assist in identifying the critical issues municipalities are facing as a result of using one delivery method, DBB, as well as the critical success criteria and factors that need to be addressed in selecting the optimum delivery method for future municipal projects. The findings of the study could then be used in future research aimed at developing a decision-making model for the selection process.

1. 4. Scope and Limitations

The scope of this research study will be limited to municipal projects in Saudi Arabia. It focuses on evaluating the impact of the DBB or "traditional" delivery method on the different phases of the project life cycle, including the initiation phase, the planning phase, the execution phase, the close-up phase and the commissioning phase.

Although there are 260 municipalities, ranging from the major municipalities (Amanah) to small municipalities (Baladia) and sub-municipalities (sub-Baladia) that are geographically scattered over Saudi Arabia, this study will be limited to only the 16 major municipalities (Amanahs), representing the geographical government administrative areas (Muhafadhah). The study's limitation to the 16 major municipalities in Saudi Arabia (excluding the Baladia and sub-Baladia) is necessitated by considerations of the accessibility of the data required by the researcher. Nevertheless, this limitation is not a real constraint in terms of overall coverage and of obtaining data on projects undertaken in all areas of Saudi Arabia. This is due to the following:

1. Almost all the small municipalities and sub-municipalities report administratively to the major municipalities and their data will be obtained through these latter.
2. Municipal projects have common characteristics (parties involved, use, financing, regulations, and so forth) that are unique when compared to other types of construction projects.
3. The existing similarities in the legal and construction environments among all regions of Saudi Arabia allow the generalization of the findings of this study to other regions of the country.

The scope of this study will be limited to the evaluation of the impact of the DBB delivery method on the life cycle of construction projects and to an investigation of the most appropriate delivery system which municipalities could use to achieve their project objectives. It is important to note that the intention of this research study is not to develop a detailed selection model, as this would require specialist knowledge of computer programming, construction methods, contractual issues and materials.

CHAPTER 2: LITERATURE REVIEW

Throughout history, people have endeavored to build facilities that can meet the needs and requirements of human habitation. Any such construction project is, therefore, initiated by the needs and requirements of prospective inhabitants. In order to satisfy such needs in terms of time, cost and quality, a number of construction delivery methods have traditionally been deployed to achieve the desired result. Requirements of clients and owners produce an end product by using one of several different delivery methods that have emerged over time. As with other industries, construction has been in a state of continuous improvement in order to overcome the issues and concerns of previous practices and methods (Fisk and Reynolds, 2010).

A number of construction delivery methods have developed over the years. These are based on the contractual and organizational arrangements that manage and control the relationship between all the parties involved in a given building project. The planning and construction of any new building requires the continuous collaboration of parties from different specialty, knowledge and skill areas. Historically, early construction methods were primitive but effective in that they successfully translated a client's vision into a completed project. As modern technology replaced the older methods of these early builders, different types of construction together with the skill sets and specialized knowledge required for completion were needed to keep pace with the changes.

2. 1. History of Project Delivery Methods

The project delivery method was historically initiated via the Master Builder (MB) approach. The MB is an approach that provides both the design services and construction activities via a single contract. The strength of this approach is that "single-point" responsibility is retained by the client or the owner. Research indicates that the term "Master Builder" is no longer used in today's construction industry, as different terminology is preferred.

Due to the specialization and complexity of an individual project's design and its need for different internal engineering specializations (for example, mechanical, electrical, civil, and so forth), the Design-Bid-Build (DBB) system, also called the "Traditional" approach, was introduced as an improved delivery method. This method separates the procurement process into three stages: design, bidding and, finally, the actual construction of the project. Nonetheless, the fragmentation of the process and the disparate responsibilities of the parties involved in the project mean that owners often express their dissatisfaction with the DBB method; it does not assist them in controlling time, cost and quality.

In order to overcome the separation of design from construction, the Construction Management (CM) delivery method or "At-Risk Construction Management" method was introduced. In many ways, this is similar to the DBB. The construction manager enters into a contractual agreement with the owner to provide building services. Depending on the text of the agreement, the construction manager offers to provide different levels of service. This may require the CM to act simply as an advisor, assisting the owner in the

pre-construction and construction phases. However, the role is flexible and the CM may act as an agent, assisting the owner through the inception and preparation of a feasibility study all the way through to the selection of an appropriate engineering firm, prime contractors, subcontractors, suppliers and other services needed for the project (CMAA, 2008).

During the planning phase, the CM may furnish the owner with constructability advice or help in the drawing up of a contract between the owner and other parties. He may also provide an arrangement that allows the owner to be involved in similar ways to the DBB method. The system addresses the fragmentation problem to an extent while strengthening coordination between design and construction.

The Design-Build (DB) method differs significantly from DBB in that the owner has a single contract with the DB entity, covering both the engineering design and the construction. The major benefit is that a single responsibility contract with the owner eliminates claims and disputes resulting from design errors. Any such disputes become the sole responsibility of the DB entity and will not affect the owner. The relevant literature review will focus on this specific delivery method and will cover a number of aspects relevant to its development and implementation.

In the DB method, the owner has a single contract with a single entity to fully perform the design and construction activities. Stakeholders involved in this method include the owner or client, the designer, builders and the design-builder, fabricators, subcontractors and suppliers. They are organized under the umbrella of a single entity that is hired by the owner to construct the project and its entire related infrastructure. The arrangements

under the design-build entity can take different forms, including that of a single firm, a joint venture or a network of separate subcontractors (Fisk and Reynolds, 2010).

The last option considered in the literature on project delivery methods is a variation of the DB method – the Build-Operate-Transfer (BOT) method – which is particularly suited to infrastructure projects. This method is also referred to as the "total package option," with its own variations, such as the Build-Operate-Own (BOO), Build-Transfer-Operate (BTO) and Build-Operate-Own-Transfer (BOOT) models. Under the BOT system, the client's requirements are fulfilled through a legal or business entity, for example, a joint-venture group, contracted to build and operate a facility for a "concession period" before transferring ownership to the client. A distinct advantage of this arrangement is that it allows for the recovery of costs during a project's operation via the payment of fees, tolls and other charges by end-users. Another important function of the BOT approach is that it establishes clear provisions for the allocation and management of risk for all parties involved. Because the BOT entity often undertakes the financing, design, construction and operation of the facility, the financial and legal risks are significantly reduced for the client. Nevertheless, the BOT arrangement can also lead to significant setbacks due to the size of such projects, particularly public projects, which can be negatively affected by government regulations, public bidding processes, political meddling and other obstructions that can jeopardize funding, especially from private stakeholders (Walker and Hampson, 2008).

2. 2. Terms and Definitions of Delivery Methods

Even in publications such as “Client Advisor,” there is no constant or common definition of a project delivery system. The Project Delivery Institute (PDI) defines the project delivery method as “the structure of the relationships of the parties, the role and responsibilities of the parties, and the general sequence of activities required to deliver the project” (PDI, 1999).

In the United States, this definition can be simplified through looking into the structure of the relationship and the roles and responsibilities of the client or owner. The structure of the relationship between the design and construction activities can then lead to the definition of the delivery method, which could be single-responsibility, dual-responsibility or triple-responsibility (Moore, 2000).

We can define the contractual relations, roles and responsibilities and the involvement of parties in a project as the “Project Delivery Method.” Furthermore, the Associated General Contractor (AGC) defines the project delivery method as: “The comprehensive process of assigning the contractual responsibilities for designing and constructing a project. A delivery method identifies the primary parties taking contractual responsibility for the performance of the work.” (Ghavamifar and Touran, 2008)

2. 3. Selection of Project Delivery Method

Although the selection of the most appropriate delivery method is essential for the success of the construction project, there is no perfect delivery method that is always the best fit for all types of project. The selection can be performed either subjectively based on experience or objectively using scientific approaches. Research in the area of delivery method selection has suggested a number of approaches that could be considered in selecting the delivery method for a project. Some approaches eliminate unsuitable delivery methods using simple judgment, while others discuss the specific environments and conditions of the project, use graphical guidelines to help in making the final decision between two delivery methods, employ a web-based selection tool specifically for the DB delivery method or operate through the use of the Analytical Hierarchy Project (AHP) (Al Khalil, 2002).

In all delivery methods, there are many factors that need to be considered in order to choose the most appropriate course of action. These factors could be grouped under different categories, including project characteristics and the considerations important in a particular project, owner or client preference, or considerations of team selection.

Characteristics and Considerations of the Project:

Every project has its own unique requirements that should be considered. These requirements are:

- ***Scope*:**

  This is the full extent of the project and must be shown with clarity in the design process. In other words, how well-defined is the project scope during the design stage?

- ***Schedule:***

  This is the timeframe to be employed in setting the duration of the contract.

- ***Complexity and Uniqueness:***

  This defines whether the project is simple, repetitive or something complex and unique.

- ***Cost:***

  This is defined as either "lump-sum" or "cost-plus." A DBB contract favors a lump-sum approach.

- ***Owner's Needs:***

  The client will have specific requirements that are unique to each project. Among the owners' needs are feasibility, constructability and value engineering studies, as well as the preparation of contract packaging.

Owner's Preferences

Owner preference can be further divided into three areas:

- ***Responsibility:***

  Responsibility amounts to ascertaining who is responsible for what. In other words, where do one person's responsibilities end and another's begin?

- ***Design Control:***

  Design control and owner involvement both refer to the extent to which an owner is allowed to intervene in the process of a project. Some owners may have useful suggestions to make, while others may impede progress by making irrelevant or impossible demands.

- ***Owner Involvement after the Award of the Contract:***

  It is important to set the ground rules before any contract is signed. These rules should determine the level of involvement an owner has during the construction of the project.

Team Selection Considerations

The selection of the project team should take into account the following factors:

- ***Regulations and Policies:***

  Are there any government or owner mandates in the selection process?

- ***Availability and Experience:***

  What is the available experience in that specific area with regard to design and construction relevant to the project that will be designed and constructed?

- ***Relationship:***

  What kind of relationship does the owner have with particular designers and/or contractors?

- ***Team-Building:***

  Which team members will provide the best opportunity to build a winning team?

2. 4. Types of Construction Delivery Method

There are a number of delivery methods that are currently emerging in the construction industry. These methods differ in terms of contractual relationships, risk allocation, stakeholder roles and responsibilities, and so forth. These delivery systems are: the Design-Bid-Build "Traditional" delivery method, the Design-Build delivery method, the Construction Management delivery method, and the Build, Operate and Transfer delivery method.

2. 4. 1. Design-Bid-Build (DBB) Delivery Method

This is also called the "Traditional" delivery method, and revolves around the relationship of two entities in separate contracts with the owner (Figure 2.01). This delivery method remains the most popular delivery method in the construction industry worldwide. It involves two contracts with the client or owner. The first entity that has a contract with the owner is responsible for developing the design and all the bidding documents. The selection of the designer is achieved, in most cases, through negotiation. The second entity is presented by the general contractor firm or the construction entity. The method usually used to select the general contractor is based on bid price, and in most cases the lowest bidder wins the bid.

In this traditional approach, the designer typically retains the responsibility of responding to the contractors' questions and clarification inquiries related to the design of the project and acts on behalf of the owner. The responsibility may extend, if the owner so wishes,

to assisting the owner in administering the construction contract, monitoring construction progress, reviewing progress payments, and so forth.

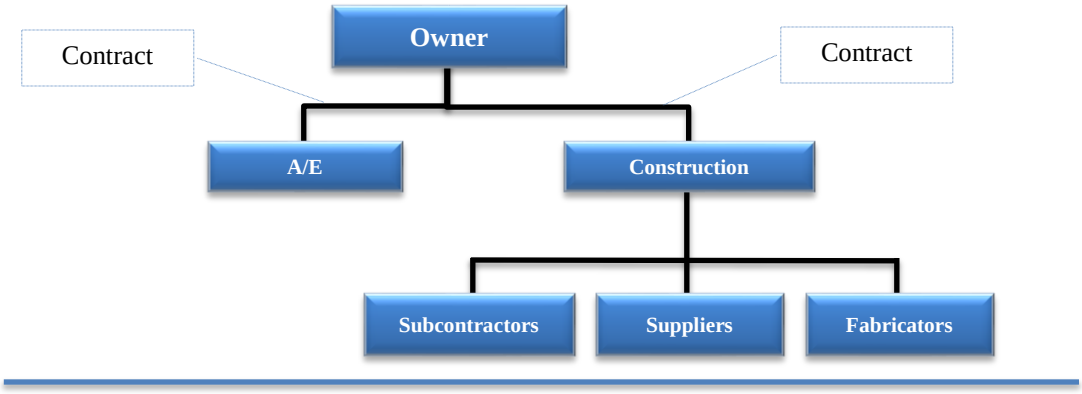


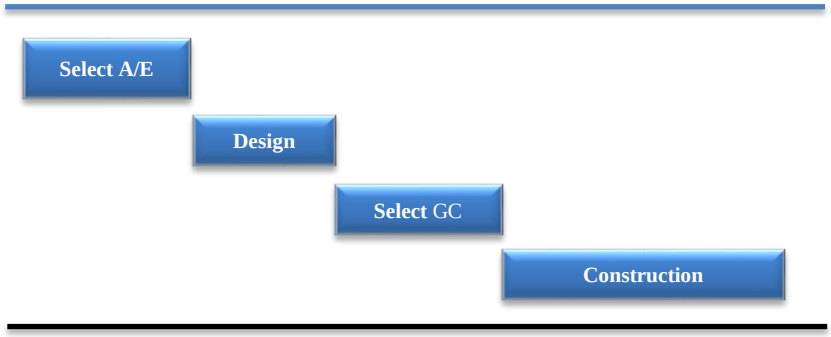
Figure 2.01 Design-Bid-Build (DBB) "Traditional"

The advantages of the DBB method are apparent, and it is widely accepted and used for public projects in order to ensure fairness among bidders. It is well-understood and well-established and clearly states the roles and responsibilities expected of all bodies involved in the project. One of its biggest advantages from the perspective of the owner is that it offers the client a significant amount of control over the end product, especially in cases where the product is being designed and specified prior to the selection of the general contractor.

As with the other delivery methods, there are limitations in using this traditional delivery method. This delivery method is seen as time-consuming, as it requires the full completion of each phase prior to the initiation of the succeeding phase (Figure 2.02 below). For instance, the owner cannot solicit a construction contract prior to fully completing the project design and specifications and all supporting bidding documents. Another disadvantage is that the designer may have limited capability to evaluate the

schedule and cost complications compared to the original design, which may lead to a costly project. Moreover, clients generally encounter contractor claims over design and constructability issues. The adversarial relationship between owner, contractor and designers is viewed as a disadvantage of this approach as it does not encourage cooperation between the parties involved in a project. Lack of incentive for a contractor to pursue a cost-reduction approach in constructing the project, and the lack of constructability experience during the design stage are perceived as major limitations of this delivery method.

Figure 2.02 DBB General Sequence of Activities



2. 4. 2. Design-Build (DB) Delivery Method

During the past decade, the Design-Build (DB) delivery method has become more popular in the international construction industry. This popularity derives from its success in resolving issues related to the lack of a single authority responsible for the design and construction areas. As we have seen, the number of fragmentation issues occurring between the design stage and the construction stage can be significantly reduced.

In the DB method, the client or owner, whether this is the government or a private concern, enters into a contract with a single entity to perform both the design and construction activities. This ensures more efficient project quality, as design benefits from focused construction experience. Proper planning and scheduling requires the application of fast-track procedures and eliminates the design errors that were previously noted by contractors when employing the DBB construction method.

There are two types of Design-Build delivery method that will be discussed in this study. The first is the DB "Turnkey" option (Figure 2.03) and the second is the DB "Bridging Approach" (Figure 2.05). Each of these options will be discussed separately.

2. 4. 2. 1 Design-Build "Turnkey"

A turnkey project requires an owner to enter into a single agreement with one firm. The said firm will carry out all the designing, planning and construction of a building project using only its own staff, joint venture or subcontractors. A full turnkey project may also require the chosen firm to provide any necessary financing. A turnkey's biggest strength is its efficiency, since the whole project is designed and delivered in-house. This removes the risk of conflict between different firms or designers over errors in design and liability while providing the opportunity to progress from one stage of the project to the next without needing to wait for overall project design completion.

However, this system runs into difficulties when the public sector is involved. In order to ensure that public money is spent wisely, public sector projects are subject to a tendering process in which the contract is usually awarded to the lowest bidder. It can be argued

that following a project based purely on the cost factor risks eliminating the most qualified and experienced design teams. These are people who will be more interested in quality than cost *per se*. Furthermore, an over-emphasis on keeping costs down may mean that insufficient time is spent on planning and checking for errors. This, in turn, could result in expensive design changes later on, thereby negating the original lower cost.

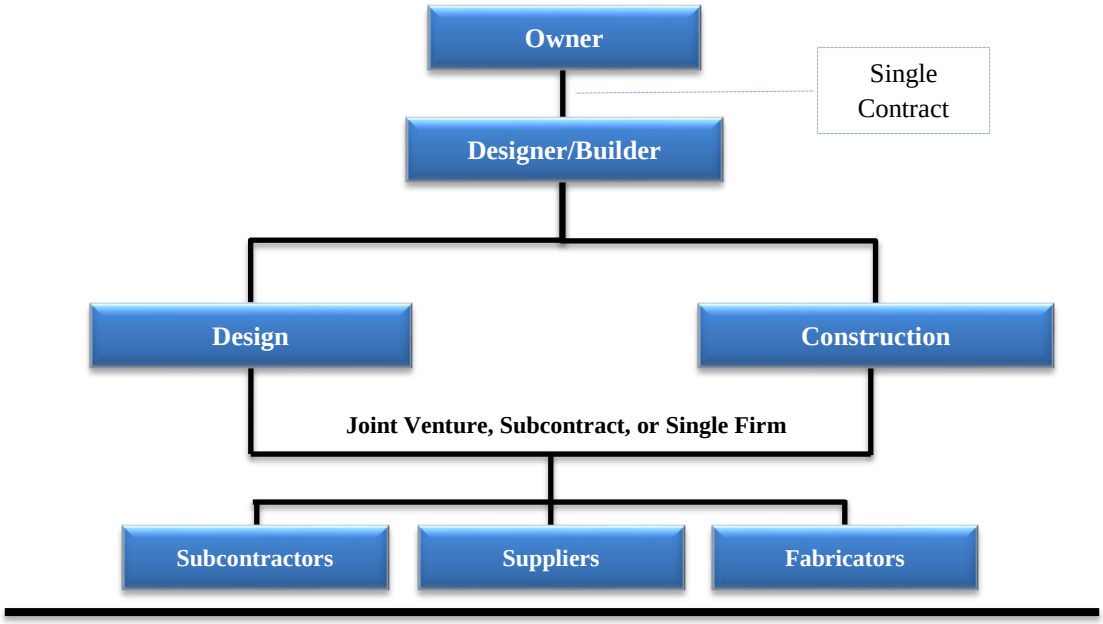
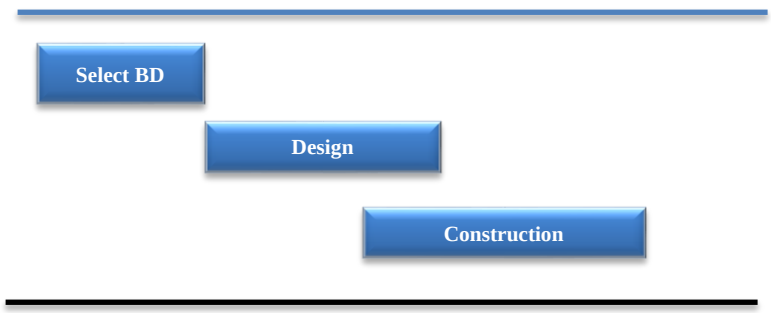


Figure 2.03 Design-Bid (DB) - Source: Fisk and Reynolds, 2010

Figure 2.04 DB Turnkey: General Sequence of Activities



2. 4. 2. 2 Design-Build: The Bridging Approach

"Bridging" can be defined as a process in which the Design-Build approach is conducted tangentially rather than directly. It can also be referred to as "Design-Design-Build" (DDB), in that an owner initially enters into a contract with a design professional in order to create relevant documents for a part, rather than the whole, of the design process. This will then be used as a means of generating bids from interested parties. What is basically happening here is that the owner is testing the market for viability while reducing his financial exposure to risks. Moreover, it is an excellent way for an owner to become aware of accurate pricing by presenting a given design to a variety of professionals. This partial-design approach creates the possibility of easier design change. It allows for the submission of proposals at a stage in the process where redesign costs are significantly lower. A consultant architect in the field of bridging is able to work directly with an owner in the preparation of development drawings. Additionally, he can help with scheduling and budget control. From here on, the owner now has the opportunity to engage the services of the bridging consultant to finish the project with a recommended architect or other design professional, or he may choose to employ the services of a different contractor altogether. He may even suggest using a completely different design paradigm.

This design can be original or based on modifications, which can then be incorporated in various ways. It may be used as a request for proposals (RFP), as something requiring development, or be left open for further discussion, criticism and adoption as the owner sees fit (Levy, 2006).

There is, however, the issue of liability for anyone who takes on the role of bridging architect. For example, if an original design is subsequently developed by a different firm of architects who discover that initial design errors have been made, who is responsible for those errors? Then there is the question of ownership. Does the design become the sole property of the owner once he has paid for the bridging consultant's services, or does the original architect retain a license? The key point is that whoever completes a project may be the recipient of praise or blame that may, in fact, be due to the original designer.

In the United States, the American Institute of Architects follows a Code of Ethics and Professional Conduct. The Code relates to precisely this issue of recognizing who should share the credit for a good design or be penalized for a bad one. Any owner thinking of using the services of a bridging architect needs to be aware of this very important consideration beforehand.

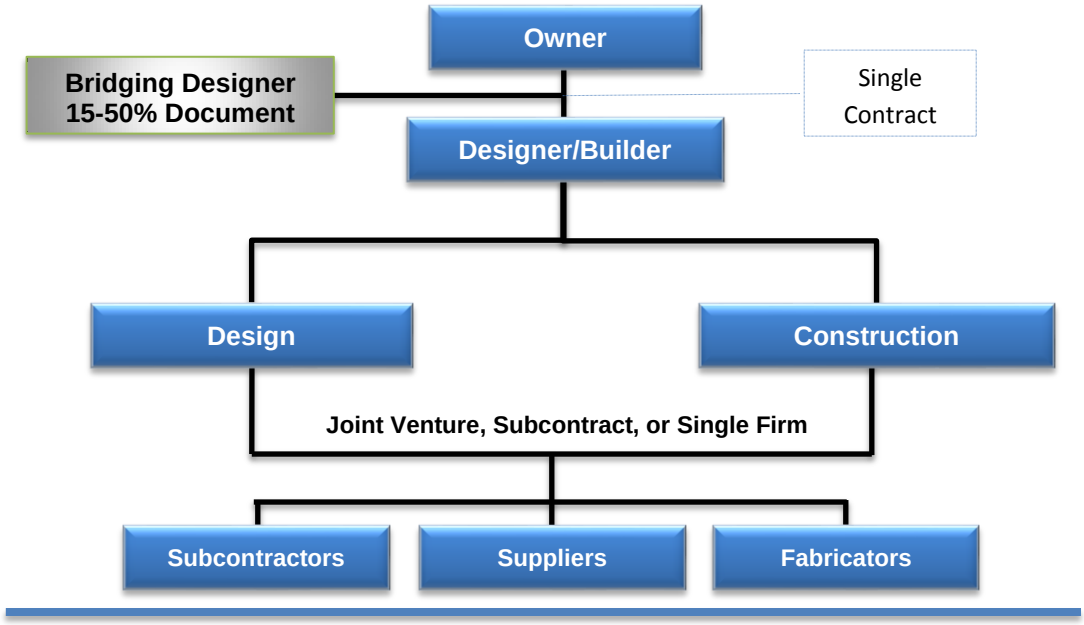
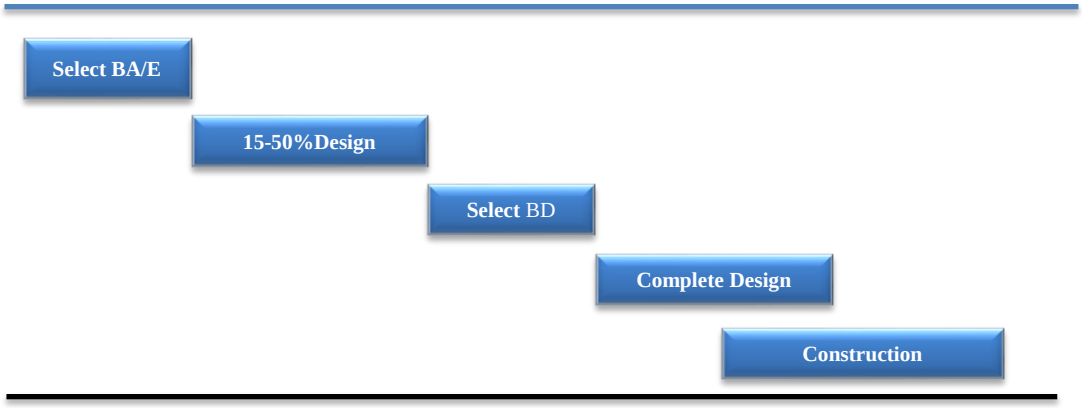


Figure 2.05 Design-Bid (DB) - Source: Fisk and Reynolds, 2010

Figure 2.06 DB Bridging: General Sequence of Activities



2. 4. 3. Construction Management (CM) Delivery Method

The terms "Construction Management" or "Construction Manager" (CM) are used interchangeably for this delivery method. This method has some features which are similar to the DBB method, in that the client or the owner will have separate contracts with the designing firm and the construction entity. The construction manager, a third party who acts on behalf of the owner, will fulfill several duties during the design, construction and close-out phases. The services that could be offered by the CM can extend to: the selection of the design firm, provision of feedback on the design, the constructability review, value engineering, a construction estimate to ensure that the project will stay on budget, contract packaging and also the selection of prime and subcontractors for the construction of the project (Al Khalil, 2002; Ohrn and Rogers, 2008).

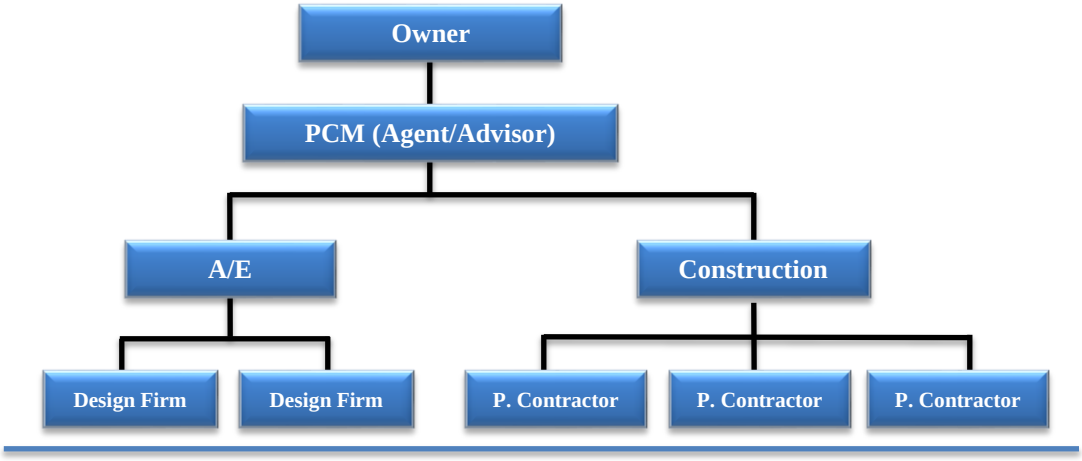


Figure 2.07 Construction Management

The role of the PCM during the construction phase is vital to assist the client in coordinating and managing the intensive work and relationships between the contractors, the suppliers, and the fabricators. The CM may be hired to perform construction activities, to deliver materials, to provide machinery, fabrications, and so forth. Although the CM delivery method does not fully address the issue of fragmentation reported in the case of DBB, it minimizes the separation between the design and construction stages. The other positive aspect of the method is that it allows fast-track scheduling, which shortens the completion time of a project.

The involvement of the CM could be seen as different depending on the type of agreement with the owner or client. The role could be as simple as to provide advice to the owner or as an agent who can act on behalf of the owner in dealing with contractors and all parties involved in the project. Each of the CM roles will be discussed separately.

2. 4. 3. 1 CM As "Advisor"

In this role, the CM will be involved with three parties: the owner, the engineering or design firm, and the prime contractors. The owner contracts with an engineering or design firm to prepare the design and the bidding and construction documents. After the completion of the design, or sometimes concurrent with the design stage, the client involves a CM to oversee the design with respect to the implications for budget, construction duration and constructability by applying value-engineering techniques. The role of CM as advisor should be compatible with the role of the design firm, as they both help the owner in selecting the prime contractors for the project and remain as advisors through to the completion of the construction by performing contract administration and certification functions, especially for large and complex projects.

In this CM delivery method, all the contractual agreements with parties involved in the design and construction activities are signed directly with the owner or client. The limitation perceived in this arrangement is that an additional cost will be incurred by the owner in respect of an entity which is viewed as the engineering or design firm. The arrangement is also viewed as creating a possible confusion of the traditional roles as between the CM and the engineering or design firm, especially if the contracts are not compatible. Furthermore, it is considered a relatively lengthy process and one which creates complex relationships (Shapiro, SHK).

2. 4. 3. 2. CM As "Agent"

The involvement of the CM as an "agent", liaising with the design or engineering firm and the prime contractors, begins when the owner first selects a professional entity to arrange for all activities, from the selection of all parties who will be involved in the project through to the completion and close-out phases. This involvement differs from the CM as advisor as it entails more responsibilities, with the CM acting as an agent representing the owner in all aspects of the project.

For the owner, the CM as agent is responsible for all phases of the project. The design or engineering firm will not be playing any other role beyond the design, which regulates the process and eliminates any possible confusion that might occur in the CM as advisor configuration. This involvement is viewed as appropriate for an owner who does not have the time and expertise to develop a project and to oversee the project's progress or who does not wish to get involved in the day-to-day project activities. It is also perceived as a single point of responsibility compared to the CM as advisor, in the sense of having the CM as agent take over the design or engineering firm roles in overseeing the construction activities with prime contractors. Similar to all arrangements involving the CM, this role will help in coordinating the overlap between the design and construction phases with the aim of expediting the completion of the project by applying fast-track scheduling (Shapiro, SHK).

2. 4. 3. 3. CM As Contractor "CM-at-Risk"

Construction Management at Risk (CM-at-Risk) is another project delivery method that clients or owners use in their projects. It is initiated by the signing of contractual agreements with a sole party to furnish CM services during the design stage, and then continuing to furnish the entire necessary construction workforce (laborers), machinery and required project materials, and finally acting as a prime constructor. Adding the term "at Risk" to the CM typically addresses the responsibility by which trade contracts will be embraced by the Construction Manager, who takes on the performance risk using the "guaranteed maximum price" (GMP). This delivery method is also referred to as CM/GC and CMC (Cunningham, 2005; and Shapiro, SHK).

Research highlighting the CM-at-Risk delivery method combines different features from the DBB "traditional", DB and CM-as-Agent methods, and also from the negotiated construction contracts. In the design phase, the CM plays a vital role by joining and helping the designer, who is hired separately by the owner, as with the DBB delivery method.

The CM's expertise is furnished to the designer in terms of constructability and cost reviews. Borrowing some of the DB delivery method features, the CM-at-Risk delivery method combines both the construction activities and construction management within a single body. In this arrangement, the owner or client can, to a great extent, ensure the entire project cost. Moreover, the fast-track option can be employed and the construction can start without having the design fully completed. This single-entity arrangement is

claimed to potentially shorten the construction duration and reduce the cost, as well as shifting the risk from the owner or client to the CM-at-Risk (Cunningham, 2005).

In order to employ the CM-at-Risk, the owner can announce a request for proposals (RFP) to select the most qualified and experienced party to undertake the project from the design stage through to the completion of the project. This selection consideration is viewed as a better approach in comparison with the lowest-bid approach. Although the owner has the choice of whether to identify and sign an agreement with the CM-at-Risk prior to or after the design is completed, it is, by and large, preferred to contract the CM-at-Risk involved once the designer is selected.

In the CM-at-Risk delivery method, the project cost is arrived at through GMP. Therefore, owner or client changes can be achieved by ensuring that a separate contingency is included in the contract. Changes which will result in cost escalation beyond the GMP, but which are not associated with changes in the contract documents become the full responsibility of the CM-at-Risk. By contrast, the only compensation from the owner to the CM-at-Risk is for the General Conditions, such as on-site management and overheads, construction-related items such as temporary power, services related to the site, and cleaning and non-trade-specific services (Cunningham, 2005).

Similar to the DBB method but differing from the DB delivery method, the level of project quality in the CM-at-Risk method remains within the hands of the owner or client. This is viewed as a strong advantage of this method, as the requirement for quality control is clearly stated by the designer in the prescriptive specifications.

To review the characteristics and latent advantages of the CM-at-Risk, we can view this delivery method as: customer-oriented; allowing for the selection of the CM-at-Risk entity based on qualification rather than lowest bid; trust-based; permitting the early involvement of an experienced entity for constructability input; offering transparency in respect of project cost; fast-tracking; resulting in better risk allocation and a transparent approach with minimum change orders; and finally, ensuring that any cost savings remain with the owner or client (Cunningham, 2005).

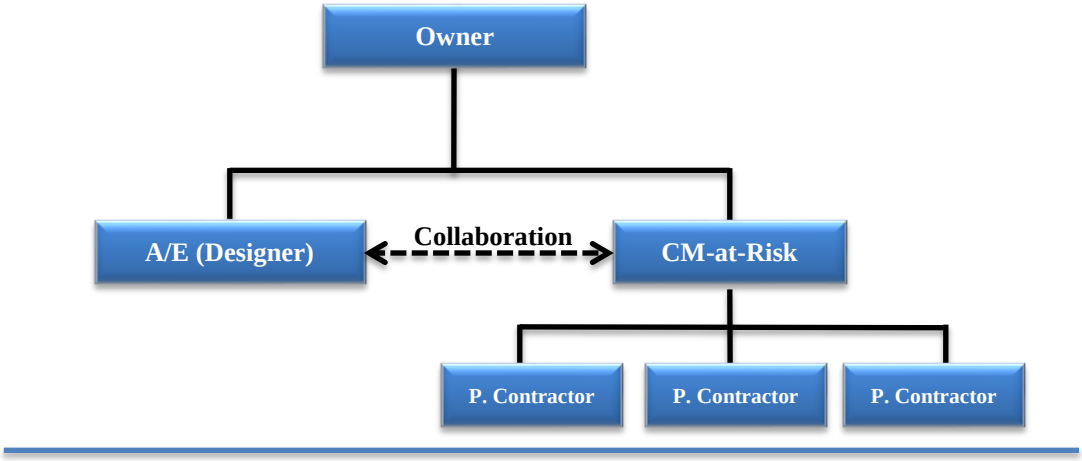


Figure 2.08 Construction Management-at-Risk

2. 4. 4. Build-Operate-Transfer (BOT)

BOT, or BOOT (Build-Own-Operate-Transfer) delivery methods are normally used in developing countries where the owner does not have sufficient financial resources to execute infrastructure projects such as highways, hydraulic structures, mass transit, municipal facilities, airports, bridges, power plants, tunnels, utilities, hospitals, hotels, and so forth. BOT is a delivery/financing system in which the private sponsor is responsible for financing, designing and constructing the project and operating the project for a

specified period of time (the concession period) in order to collect revenues to settle the debt payment and generate a profit. After the end of the concession period, the ownership of the facility is transferred to the government authority.

BOT is considered to be the most suitable process for the realignment of risks among participants (Zhang et al., 2002).

Bokharey et al. (2010) point out that the concession contract binds the host government and private owner during the concession period. Levy, as cited in Schaufelberger and Wipadapisut (2003), notes that the first successful project conducted under the BOT system was the Suez Canal, in 1868.

There are several research studies of the Build-Operate-Transfer delivery system, most of which focus on the financing strategies adopted, the risks associated with this delivery system, and on how important the selection of the appropriate concessionaire is to the success of BOT projects. The researchers found that the project conditions, the project risks and the availability of financing are the most essential factors that should be considered when selecting financing strategies.

In determining the extent to which BOT approaches are used in large projects and identifying the factors that have hindered some government organizations in using this delivery method, it was found that the availability of funds, the availability of other alternatives, political obstacles and resistance to change from both government and the private sector were the main reasons for not using BOT more widely in the United States (Algarni et. al., 2007).

As is clearly illustrated in Figure 2.09 below, there are a large number of main participants and several contracts required in guaranteeing every party in BOT projects. This makes the BOT delivery method very complex and necessitates good arrangements and good coordination.

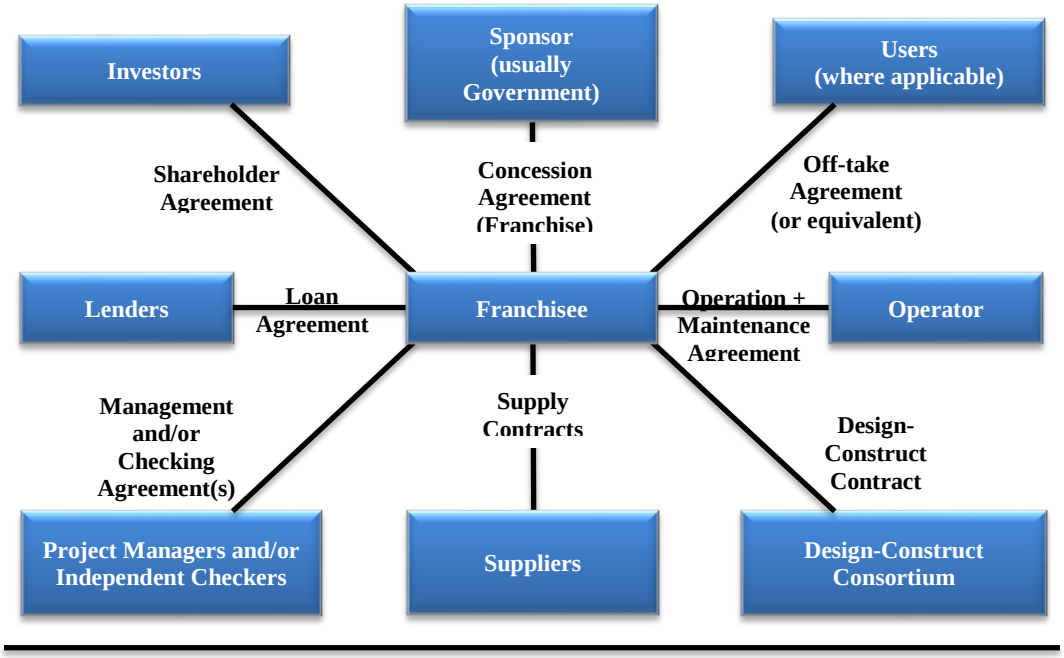


Figure 2.09 Relationship between participants in BOT procurement

Schaufelberger and Wipadapisut (2003) and Algarni et al. (2007) present the various participants involved in BOT projects, which are as follows: the first participant is the government agencies that represent the granting authority which is responsible for determining the requirements of the project, identifying the concession period, inviting bidders and awarding the contract to the most appropriate contractor. Moreover, the government provides guarantees in this type of project in order to attract private investors.

The second participant in BOT projects is the sponsor(s), which is a consortium of engineering, construction and venture capital entities.

Khan et al. (2008) state that the major parties involved in BOT projects are:

- Government owner: The government initiates the project, oversees the bidding process, and selects the appropriate concessionaire to undertake the project. Thus, cooperation with the government client is vital because the government facilitates the acquisition of the necessary approvals and authorizations for project construction and operation.
- Private client: In some cases, a private owner may substitute for the government agency. The nature of the service provided and the track record of the owner are very significant features.
- Sponsor: Usually, a consortium of interested groups respond to the government invitation, prepare a proposal on the project, and finance and operate the project. This may be in the form of a company, a partnership, a joint venture or a limited partnership.
- Construction contractor: This may be one of the sponsors who assume the risk of completing the project on time, within budget and to the specified quality.
- Operation and Maintenance contractor: The operator may sign a long-term contract with a sponsor in order to operate and maintain the project.
- Financiers: The debt finance to the sponsor is provided through banks. Also, any cost overruns that are not covered by the construction contract may be provided by the same bank or by different banks.
- Other participants: These include engineers, consultants, equipment suppliers and insurers.

The necessities for BOT arose after the Second World War, when most public projects were constructed under the control and funding of the government. However, during the early 1980s new alternatives became crucial due to the dramatic changes occurring in developing countries, such as increasing demands on infrastructure facilities due to population growth and economic development accompanying limited government budgets. One of these alternatives is the BOT approach, which avoids government having to incur high budget deficits, debt, and make cutbacks in other sectors such as education and health in order to build or upgrade infrastructure facilities (Algarni et al., 2007).

The BOT delivery system has many advantages that can be summarized in its capability to enhance the economic growth of countries without using government finance. It encourages foreign investors by furnishing attractive opportunities for investment which, by default, facilitates the transfer of technology (Khan et al., 2008). Moreover, as investors are responsible for the financial support of the project, the BOT method minimizes the depletion of the government budget by providing funds from external financiers. It also provides opportunities for contractors to work on infrastructure projects during construction and operation phases without the involvement of the government (Algarni et al., 2007).

There are a number of variations that can be used in a similar manner to the BOT approach, but with different arrangements in the precise mechanism of ownership and obligations (Kumaraswamy and Morris, 2002; Algarni et al., 2007; Grimsey and Lewis, 2000).

- BOO – “Build-Own-Operate” or “Build–Own–Operate–Transfer” (BOOT): In this system, a private entity owns the facility and operates it in perpetuity and does not need to transfer it to the government, as is the case under the BOT method.
- BTO – “Build-Transfer-Operate”: Under this approach, the facility is directly transferred to the government after construction, and the private sponsor begins the operation process in order to collect revenues. This method assists private sponsors in reducing the insurance cost that will be incurred if the sponsor owns the facility during operation.
- BOR – “Build, Operate and Renewal of the Concession”: This approach is similar to BOT, but the private sponsor has the right to request the renewal of the concession at the end of the period.
- BLO – “Build-Lease-Own”: Under this approach the private sponsor owns the facility after construction, and then leases it to the government for an extended period of time. The government becomes responsible for the operation, maintenance and replenishment of the facility. The ownership of the facility is still under the private sponsor and does not transfer to government.
- BLT – “Build-Lease-Transfer”: After construction is completed, the private sponsor leases the facility to the government or others for a concession period until recovering the initial investment and then transfers the ownership of the facility to the government.
- DBFO – Design-Build-Finance-Operate: In this system, the concessionaire receives revenues from the government instead of the end user of the facility.

- DBO – Design-Build-Operate: In this model, an investor is awarded a contract to perform the design, construction and operation of the facility. Unlike BOT, the title of the constructed facility remains with the public sector.
- DBOM – Design-Build-Operate-Maintain: In this model, the design, construction, operation and maintenance of the facility are procured by the private sector and financed by the public sector.
- ROT – Rehabilitate-Operate-Transfer: In this arrangement the rehabilitation, using private finance, is followed by a period of private ownership at the end of which the facility reverts to the government.
- ROO – Rehabilitate-Own-Operate: In this system, after rehabilitation with private funds, the facility is owned and operated in perpetuity by the private sector.

In addition to the above partnership arrangements, there are numerous types of arrangements designed to suit particular industries.

2. 5. PROJECT LIFE CYCLE

The Project Life Cycle is the series of activities aimed at creating a construction or non-construction project, and which achieves its ultimate objectives and deliverables in an organized fashion. No matter how complex or simple the scope of the project, it is important that a series of stages be followed through a project's entire duration. These stages are grouped according to a relevant timeline. The pre-construction stage includes the initiation, planning and bidding phases. The construction phase is when the project execution starts and the cycle continues through to the inspection and project closeout phases.

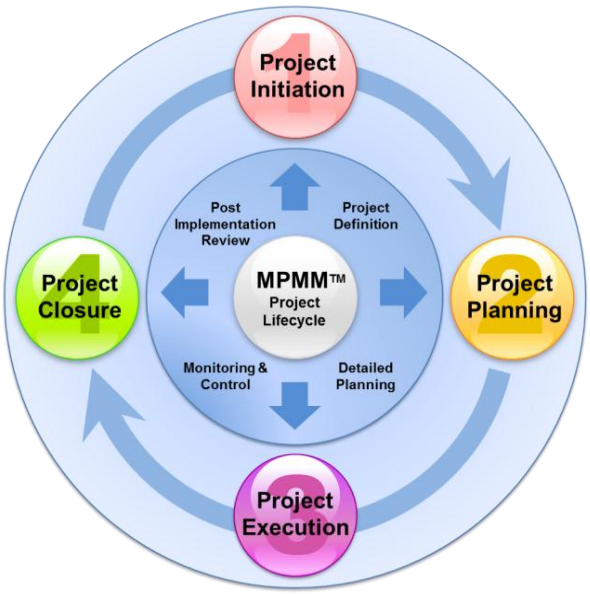


Figure 2.10 Project Management Life Cycle – Source: Westland (2007)

Typically, there are four main phases in a project. These phases are: the project initiation phase, the project planning phase, the project execution phase and finally, the project

closure phase. Each phase has a number of activities and subsequent deliverables that can jointly lead to project completion (Westland, 2007).

The grouping of activities into phases facilitates the successful completion of the project. This can be achieved through the planning and organizing of resources for all the project milestones and the carrying out of all subsequent activities and major tasks. It also helps in measuring achievable goals and justifies moving forward to the next phase, performing corrections or terminating the project on the rare occasions this action is deemed necessary.

When designing a project's phases it is essential to be fully aware of industry-specific project life cycles. This is because the nature and involvement of a project's needs and requirements will differ significantly from industry to industry. Moreover, different industrial sectors may well have different needs in respect of project life cycle methodology and management.

2. 5. 1. Initiation Phase:

The first project phase is called the Initiation phase. It is sometimes referred to as the "Birth Phase," in which outcomes and critical success factors are defined. It is usually represented by the conceptualization of the project. The objective of this phase is to demonstrate the need to embark on the project. Ideally, during this phase the project leader is appointed and selects the project team based on prior experience. The project leader seeks those who possess the required skill sets needed to accomplish the project's

objectives and goals. The essential processes of this project phase are accomplished through the creation of the following documents:

- **Project Description Document:**

This is a high-level document in which the intended specific requirements or characteristics of the project to be constructed are specified.

- **Project Feasibility Document:**

This includes all foreseen project constraints, alternatives and interrelated assumptions applied to the project to be constructed. The feasibility study of any project should include the basic elements, namely: the business problem description, the project frame (the approach or overview) which will be used to develop alternatives and, finally, a comprehensive set of recommendations.

- **Project Concept Document:**

In brief, this document addresses three important issues in order to determine the business value achieved after project completion. These questions are:

  - What is to be accomplished or constructed?
  - How will it be accomplished or constructed?
  - Why is it to be accomplished or constructed in the first place?

- **Project Charter:**

This document officially communicates the commencement of the project. It consists of three important elements, namely: project scope, associated authority, and critical success factors in the project. During this phase, a number of activities and tasks must be

accomplished. These include: conducting interviews with stakeholders and all concerned entities, gathering relevant project information via research or other activities, conducting a project feasibility study, producing a project concept statement and charter and, finally, creating any supplementary documents deemed necessary for the successful completion of the project (Westland, 2007).

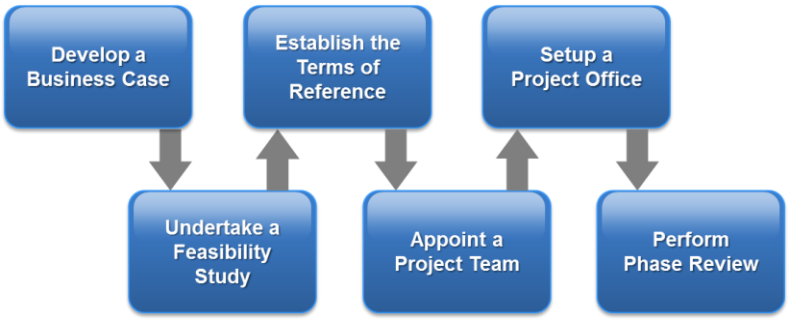


Figure 2.11 Project Initiation Phase – Source: Westland (2007)

The project leader faces certain anticipated problems during this phase, which may hinder project startup. These common problems can be summarized thus:

- Frustration that the project team might experience if the project does not start
- Lack of commitment from key stakeholders
- Increase in the level of uncertainty felt by key stakeholders or customers
- Failure to identify and recruit experienced people to join the initiation team
- Lack of agreement or compromise on project objectives and intentions can negatively impact the project and kill it before it starts.

2. 5. 2. Planning Phase:

This second phase of a project follows the initiation phase, where the project scope has been defined and the appointment of the project team has been accomplished. It entails the preparation of the different planning documents guiding the team through the project. Such documents are: the overall project plan, the resource plan, the financial plan, the quality plan, the risk plan, the acceptance plan, the communication plan, the procurement plan, a list of contacts and suppliers and, finally, a phase review plan. Other processes, such as the tender management process and any requests for information or proposals, are typically developed during this phase. The "Business Plan and Milestones' Review" is the common methodology used in this project phase.

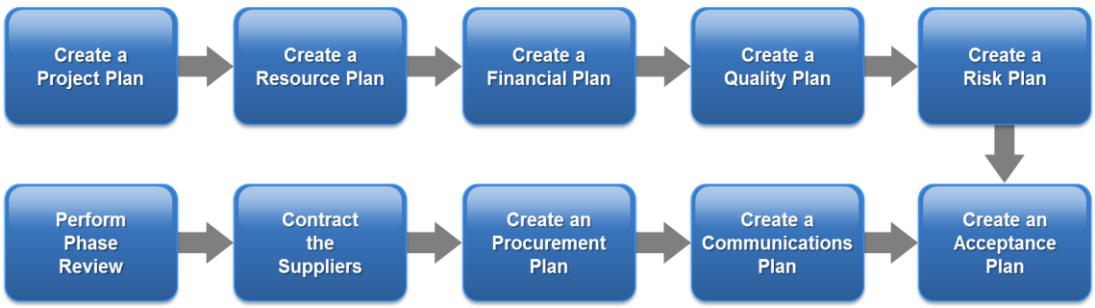


Figure 2.12 Project Planning Phase – Source: Westland (2007)

To sum up, this phase can be divided into significant milestones prior to the selection of the contracting firm that will physically construct the project. These milestones are: the design development (and its associated drawings and specifications related to the structure), earthworks, mechanical systems, and all requirements that complete the project. It also involves the procedures for inviting and selecting the contractors for the project as well as the awarding procedures and mobilization to the job site (Westland, 2007).

2. 5. 3. Execution and Controlling Phase:

This phase can only start once the project scope and requirements have been defined and approved for execution. It is where all deliverables are constructed and accepted by the stakeholders as a finished project. The phase is all about taking responsibility for managing and controlling the efficient use of resources during the construction of the project.

As shown in Figure 2.13 below, it begins by overseeing and controlling the project budget, quality, schedule, safety and related construction issues. Resource management, including personnel, materials and equipment is a very important aspect of this phase. This is one of the key roles and responsibilities of the project team. The communication and documentation of project submittals, the measurement of accomplishment and progress payments and variations are all to be handled here.

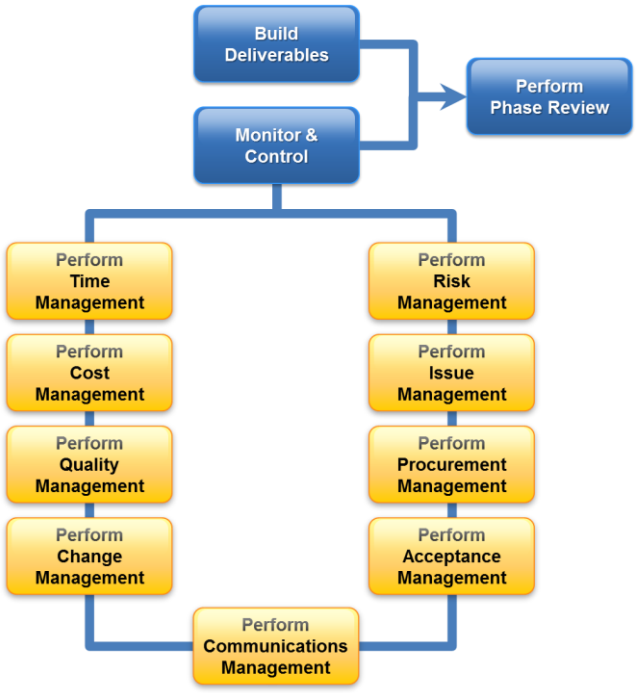


Figure 2.13 Project Execution Phase – Source: Westland (2007)

Once all the deliverables have been produced and the stakeholders have accepted the final product, the project is ready for closure. Typical processes that are carried out during this phase are: time management, cost management, quality management, change management, risk management, acceptance management and communications management (Westland, 2007).

2. 5. 4. Closure Phase:

This is the final phase in the life cycle of any project. It brings the project to an end. The official completion of a project is usually done through the initiation of formal completion certification documenting the accomplishment of all project requirements. These will have been specified in the drawings and specifications (including full compliance with contractual obligations) and to the complete satisfaction of all stakeholders.

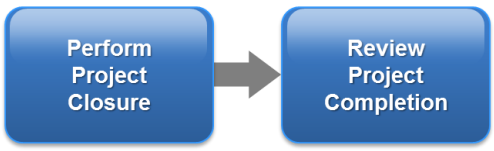


Figure 2.14 Project Closeout Phase – Source: Westland (2007)

On certain large projects, a specialist team may be required to carry out the closeout activities and to ensure that they are conducted according to the project's best interests. Such activities are typically divided into two categories: first, completing the site works (which may include the accomplishment of all physical activities) and second, completing a large number of relevant documents, associated financial paperwork, certificates, operational information relating to, for example, spare parts, and ascertaining whether further training is required or applicable. Formal closure of any project is only achieved when the project is released to its owner with the assurance of successful

matching of all the requirements originally specified. In the case of a cancelled project, this may also be achieved when the documentation of lessons learned is released. Closure includes the releasing of all resources, the paying and dismissing of the project team and the issuing of a formal project closure notification to higher management. No special tools or methodology are necessarily required during the closure phase (Westland, 2007).

CHAPTER 3: RESEARCH METHODOLOGY

This chapter presents details on all of the steps that were performed in order to achieve the objectives set for the study. It includes all information relevant to the collection of the required data, the target population and data-collection methods, together with the methods that were used to analyze the data.

The first section details the types of data that were required for the study.

3. 1. Data Required

The objectives of this study made it imperative to solicit information and specific data on the delivery method (DBB) used to undertake government projects, including municipal projects. The required data included, but was not limited to, the following: the implementation of the DBB delivery system, the experiences of municipality staff in using the DBB delivery method in completed projects, the impact of the DBB delivery method on the different phases of the project life cycle (starting from the initial conception of the project through to the commissioning phase of the project), and municipalities' knowledge of other available delivery methods and their respective advantages and limitations.

The first objective was to determine the problems which municipalities have encountered during the different phases of the project: the inception or planning phase (initiation), the design and engineering phase, the tendering (bidding) phase, the construction phase and, finally, the closure phase. The data related to the first objective was obtained from the

engineering and construction organization within each Amanah municipality. The data included data on the problems that a municipality habitually encounters in each phase of the project life cycle and respondents' views on which factors need to be considered in order to avoid such problems in both current and future projects. Such details include, but are not limited to, the planned and actual start and completion dates, the original budget and actual completion cost, quality issues, claims, and so forth. The second objective was to evaluate the effects of the DBB delivery method on the cost, time and quality criteria for municipal projects. The third objective was to investigate the most appropriate delivery system which municipalities could use to achieve their project objectives.

The following section describes the principal methods of data collection in respect of these three research objectives.

3. 2. Data Collection

In order to obtain the required data for this study, a comprehensive questionnaire survey was developed in both English and Arabic, in both hard copy and electronic formats (Appendix I includes the Arabic version and Appendix II includes the English version). The questionnaire was designed to include an introduction and three principal parts, and comprised the following elements:

- An introductory page which provided definitions of key terms related to project delivery methods in order to establish common understandings of various study subjects.

Part 1:

- A section which solicited information on respondents and Amanahs, covering respondents' education level and study major, their overall experience with construction projects, their knowledge of the various project delivery methods and, finally, their experience of implementing these specific delivery methods in the context of Amanah projects.

Part 2:

- A section soliciting information on the different types of Amanah projects and how these projects were handled in terms of the delivery methods used.
- A section soliciting evaluative information on the respondents' experiences with the DBB delivery method in terms of the three Project Value Performance criteria of Time, Cost and Quality in order to highlight the strengths and weaknesses of this delivery method in relation to Amanah projects.
- A section centered on respondents' level of agreement, measured on a Likert scale, with 32 statements derived from a review of the relevant literature. This section was included in order to verify respondents' practical knowledge levels in respect of the advantages and disadvantages of the DBB delivery method.
- A section which solicited key information about the DBB delivery method during different phases of the project life cycle.

Part 3:

- A final section centered on the elicitation of data on problems which the Amanahs are currently encountering in the use of the DBB delivery method, which is mandated by the Saudi government's purchasing regulations. Respondents were additionally requested to provide possible practical intervention strategies to address each of these problems.

The questionnaire was designed so as to be as user-friendly as possible, in most instances requiring the respondents only to check a particular pre-selected item or table cell or to supply a figure or percentage. The single exception was the final section. This section was essentially open-ended, requiring respondents to supply a more extended commentary.

In order to validate the language of the questionnaire, the English version was shared with non-technical professionals who are highly proficient in English. After corrections to the language, it was further reviewed by colleagues who are studying in the Construction Engineering and Management program at King Fahd University of Petroleum and Minerals in order to validate its technical accuracy. The questionnaire was then translated by the researcher into Arabic and shared with engineering professionals within the municipality of Al-Khobar.

The following section provides details of the methodology in respect of the survey population and sample.

3. 3. Population and Sample

The survey targeted the 16 Amanahs in Saudi Arabia. The process started by identifying suitable contacts, either Mayors or Deputy Mayors for Construction and Projects. These high-level officials were contacted and the study was described in detail to each of them. All showed genuine interest in participating in the survey. In the first instance, the questionnaires were emailed to all 16 Amanahs. Face-to-face interviews were then arranged and conducted with representatives of seven (7) of the Amanahs, namely: Riyadh, Makkah, Jeddah, Medina, Eastern Province, Taif and Al Hasa. Telephone interviews were conducted with representatives from Qassim and Tabuk Amanahs. The remaining five (5) Amanahs, namely: Hail, Baha, Najran, Jouf and the Northern Borders were surveyed using electronic mailed questionnaires.

Table 3.01 below shows the name of the Amanahs, the number of municipalities under each Amanah, and the mode of survey (MOMRA, 2010).

#	Amanah	♣ Number of Municipalities	Mode of Survey
1	Al Riyadh	45	Mailed Questionnaire (Electronic) Face-To-Face Interview
2	Makkah	2	
3	Jeddah	12	
4	Medina	17	
5	Eastern Province	20	
6	Taif	8	
7	Al Hasa	3	
8	Qassim	25	Mailed Questionnaire (Electronic) Telephone Interview
9	Tabuk	11	
10	Hail	16	Mailed Questionnaire (Electronic)
11	Baha	10	
12	Najran	9	
13	Jouf	8	
14	Northern Borders	8	
15	Asir	28	Did Not Participate
16	Jazan	23	

♣ Municipalities under the administration of the respective Amanah

Table 3.01 List of Amanahs and Mode of Survey

The sample selection was made from the list of projects completed within the last five years. These include projects that were built within the geographical limits of the main cities, as well as other cities within those municipalities' domains.

The following section provides details of the methodology used in the analysis of the data.

3. 4. Data Analysis

A cut-off date of mid-October 2012 was set for the collection of the completed survey data. Completed questionnaires were received from fourteen (14) Amanahs, namely: Riyadh, Makkah, Jeddah, Medina, Eastern Province, Taif, Al Hasa, Al Qassim, Hail, Al Baha, Tabuk, Najran, Al Jouf and the Northern Borders.

The collected data was analyzed using Microsoft Excel® software to compute descriptive measures such as the measure of central tendency, the mean, the median and the mode. Moreover, the analysis covered measures of variations including, but not limited to, the variance and standard deviation and *z*-test scores. Correlations between variables were investigated as deemed necessary. The data analyzed is presented using various formats, such as graphs, tables, lists and charts.

CHAPTER 4: RESULTS AND DISCUSSION

This chapter presents the analysis of and findings from the data gathered through the survey developed for evaluating the effects of the traditional "Design-Bid-Build" delivery method on municipal projects in Saudi Arabia. The chapter comprises three sections. The first section gives general information about the respondents and the municipalities they are representing. The second section presents information related to the type of projects undertaken by the municipalities and the project delivery methods generally used for those types of projects. It also details the effects of the DBB delivery method on the three project value criteria, namely, time, cost and quality. Furthermore, the section addresses the advantages and disadvantages of the DBB delivery method from the practical perspective of the survey respondents. Finally, this section presents the findings on how municipal projects are being handled during the different phases of the projects' life cycle. The final section of this chapter highlights the problems that municipalities in Saudi Arabia are facing, and the interventions they themselves have proposed to overcome these problems.

4. 1. Profile of Respondents and Municipalities

This section presents information about the respondents' education level and major field of study, experience with municipal projects and knowledge regarding the different project delivery methods.

4. 1. 1. Classification of Municipalities

The Saudi Ministry of Municipal and Rural Affairs (MOMRA) designates the sixteen municipalities as "Amanah." However, the administrative level of the Amanah municipalities varies based on several factors. Chief among these factors is the geographical size of the municipality. Five (5) of these Amanah municipalities are headed by "Excellency"-level Mayors. The remaining eleven (11) Amanahs are headed by Mayors of varying levels. Of the sixteen (16) Amanahs invited to participate in the study, complete survey feedback data was received from fourteen (14), corresponding to 87.5% of the invited Amanahs, in time for inclusion in the study. Table 4.01 below shows the list of Amanahs, their administrative level and participation status:

	Amanah	Headed By	Status
1	Riyadh	HE Mayor	Participated
2	Jeddah	HE Mayor	Participated
3	Makkah	HE Mayor	Participated
4	Medina	HE Mayor	Participated
5	Eastern Province	HE Mayor	Participated
6	Taif	Mayor	Participated
7	Al Hasa	Mayor	Participated
8	Al Qassim	Mayor	Participated
9	Asir	Mayor	Invited
10	Hail	Mayor	Participated
11	Al Baha	Mayor	Participated
12	Tabuk	Mayor	Participated
13	Jazan	Mayor	Invited
14	Najran	Mayor	Participated
15	Al Jouf	Mayor	Participated
16	Northern Borders	Mayor	Participated

Table 4.01 List of Amanahs, Administrative Level and Participation Status

4. 1. 2. Participants' Education and Experience

Education levels and study majors vary for the fourteen (14) respondents who completed the survey. All survey participants hold Bachelor's or Master's degrees in Engineering majors relevant to the construction industry (Figure 4.01). Either Architecture or Civil Engineering study majors were the Bachelor's degree majors of all respondents. Moreover, five (5) respondents hold Master's degrees in Construction Engineering and Management from universities in Saudi Arabia, the United Kingdom or the United States.

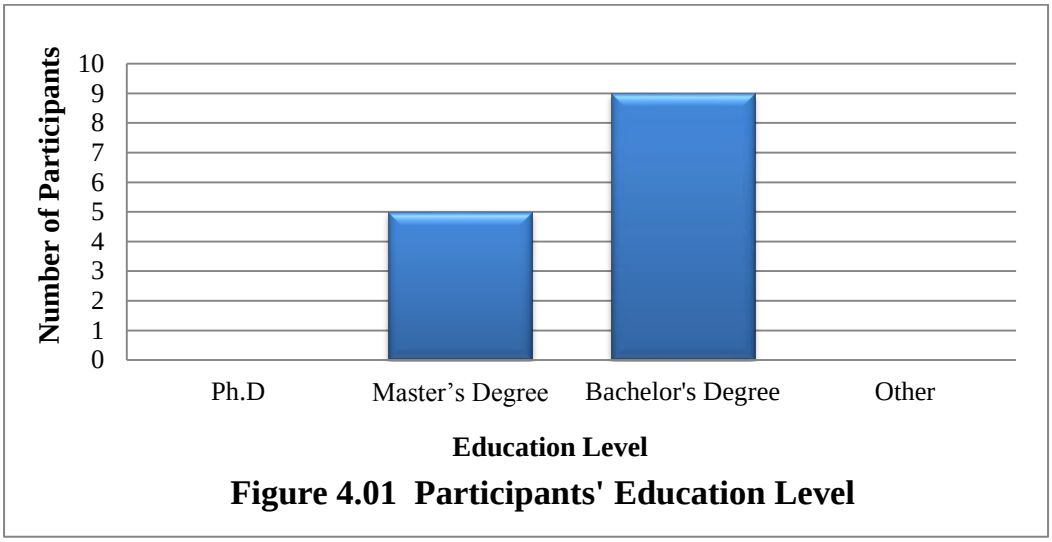


Figure 4.01 Participants' Education Level

The participants' experience specifically in municipal projects varies from more than five (5) years to over twenty-five (25), which indicates that none of the participants is to be considered new to the business of municipal projects. As we see from Figure 4.02, eleven (11) participants have more than fifteen (15) years of experience in such projects which, from the perspective of the researcher, reflects positively on the quality of the feedback data obtained from the survey participants.

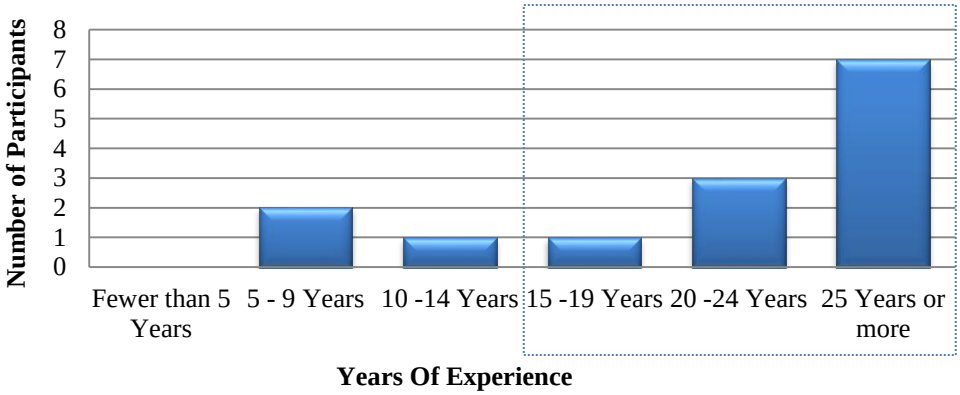


Figure 4.02 Participants' Experience with Municipal Projects

4. 1. 3. Participants' Knowledge and Experience of Delivery Methods

Analysis of the data revealed that all of the participants are aware of some or all of the different project delivery methods, namely: DBB, DB, CM and BOT (Figure 4.03).

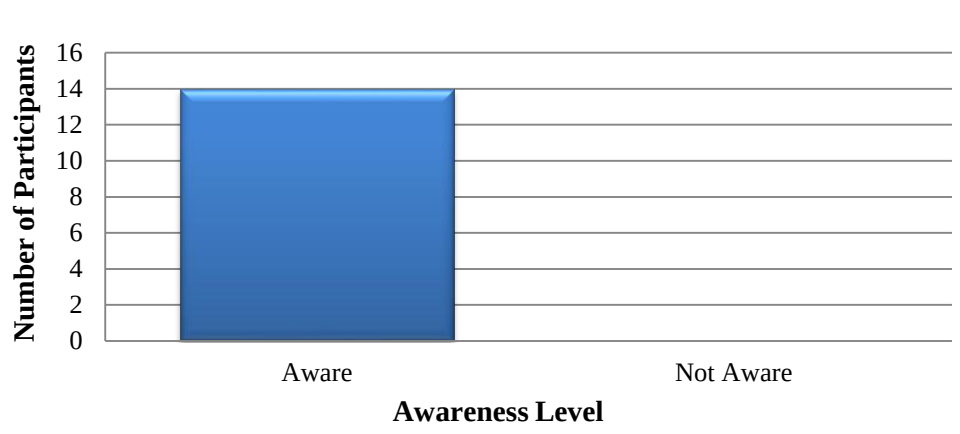


Figure 4.03 Awareness of Delivery Methods

Figures 4.04, 4.05, 4.06 and 4.07 respectively show the level of participants' awareness of the DBB, CM, DB and BOT project delivery methods:

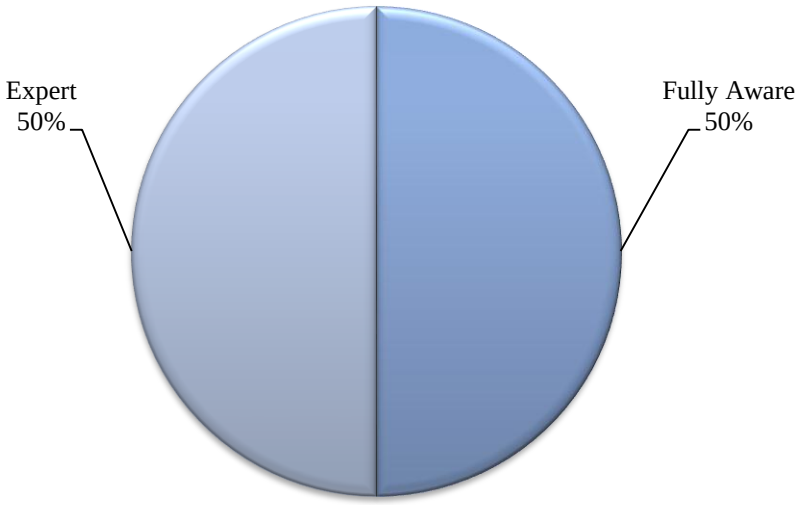


Figure 4.04 Design-Bid-Build "Traditional"

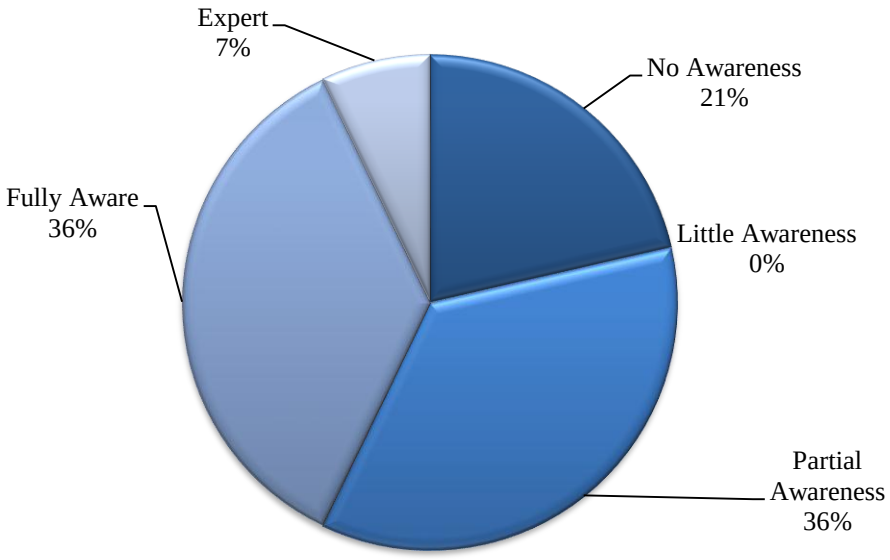


Figure 4.05 Construction Management (CM)

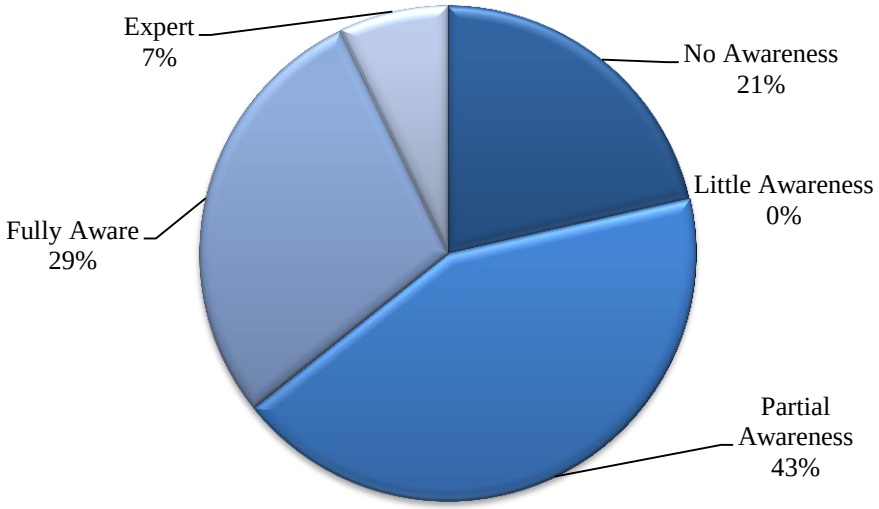


Figure 4.06 Design-Build

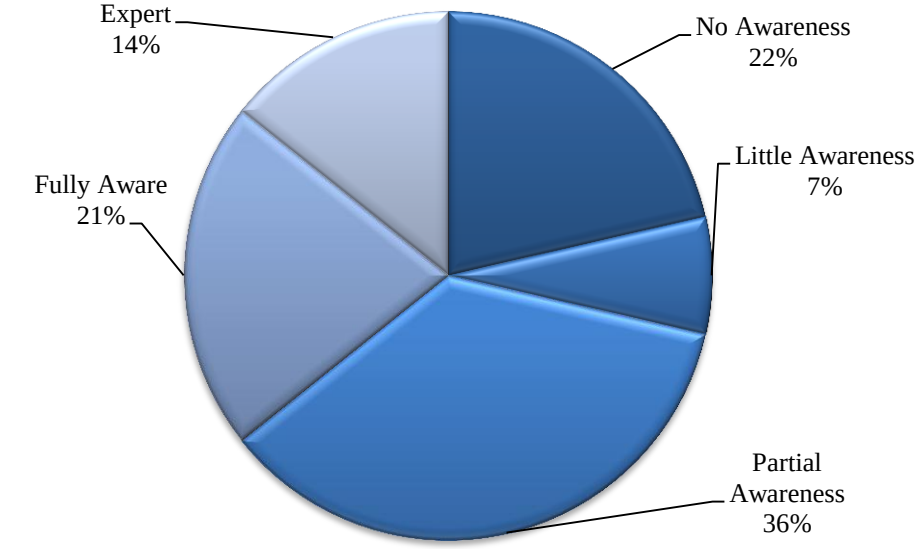


Figure 4.07 Build-Operate-Transfer (BOT)

It is clear from the above figures that all participants are either fully aware of, or are even expert in the DBB project delivery method. This high level of awareness and familiarity has been gained through the years from government projects which mandate the use of

the government procurement regulations. It was further highlighted during the interviews that this delivery method is very familiar to design firms, contractors, subcontractors, suppliers and other parties who are usually involved in any given project.

The Construction Management (CM) delivery method has gained a good deal of popularity over the past several years in the major Amanahs of Saudi Arabia. The project management firms which have been hired by the Amanahs have usually acted in an advisory role, providing consultation services and oversight during the construction phase. The interviews additionally highlighted the fact that those firms are also required to develop the capacity, knowledge and expertise of municipalities, including the training of engineers and construction-related staff.

The third type is the Design-Build (DB) delivery method. This method is known in principle; however, it is rarely utilized. It has been tried in only a very few projects and has proven to be a good delivery method for projects with complex and ambiguous scope. One municipality has already prepared the project package for an urban project to be awarded using DB in one of the major cities in Saudi Arabia. Other officials have highlighted the fact that although this is a known method, municipality projects are repetitive in nature and scope of work and so do not necessitate a change to a relatively new method for all concerned staff and parties involved in the undertaking of such projects.

The Build-Operate-Transfer (BOT) method is a very commonly-used method for almost all Amanah municipalities. However, this method has never been implemented in the

construction of an infrastructure project. It has rather been commonly used in investment, operation and maintenance activities within Amanah municipalities.

Figures 4.08, 4.09, 4.10 and 4.11 below clearly show the recent trend away from the traditional Design-Bid-Build (DBB) delivery method and toward the greater utilization of the other three types of delivery method; a trend which is reflected in the experience figures for the survey respondents.

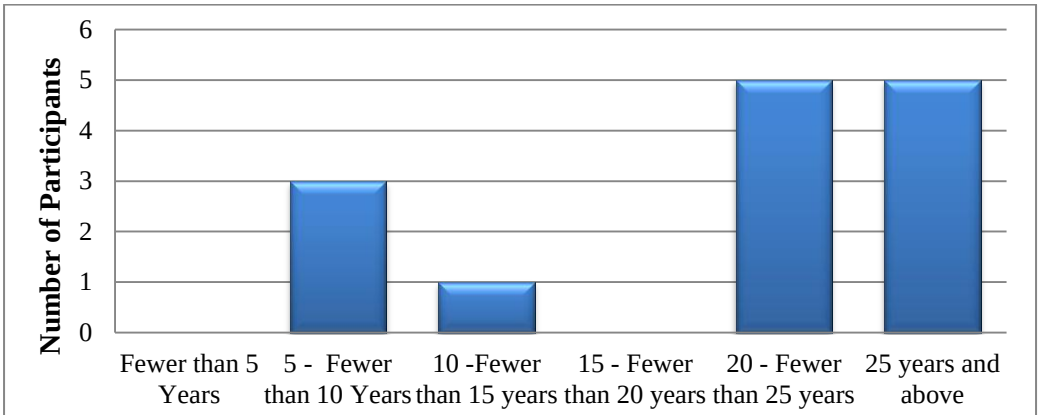


Figure 4.08 Design-Bid-Build "Traditional"

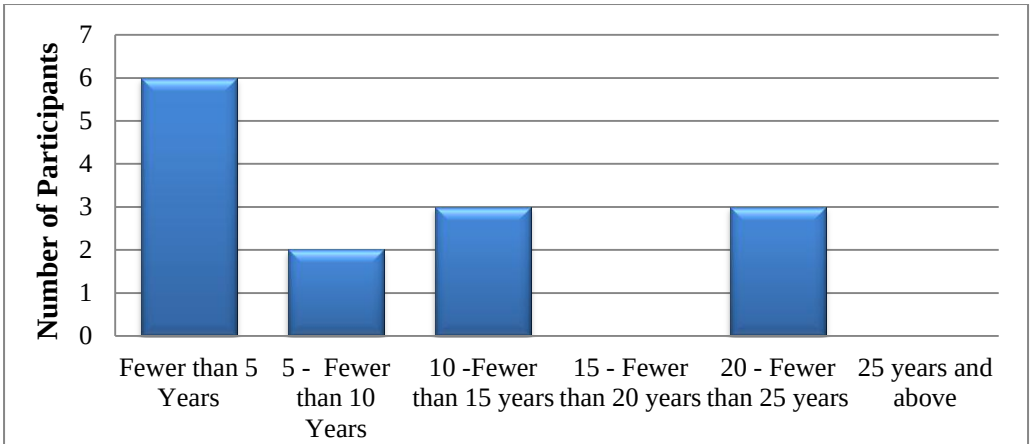


Figure 4.09 Construction Management (CM)

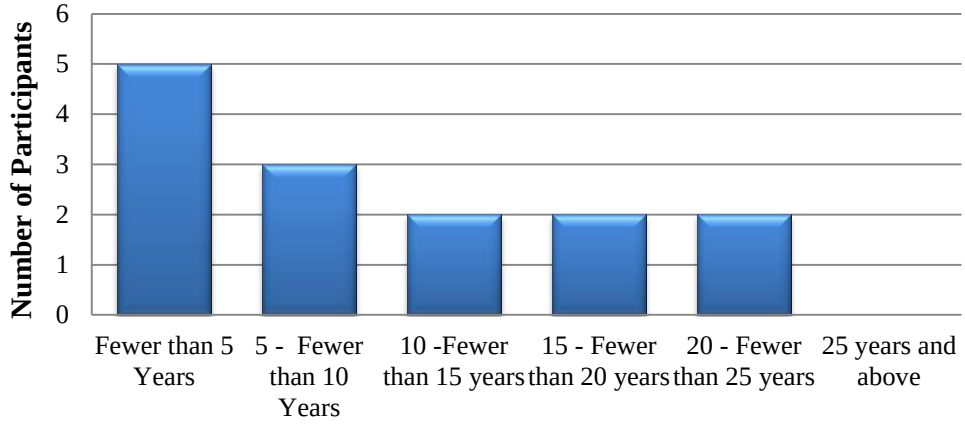
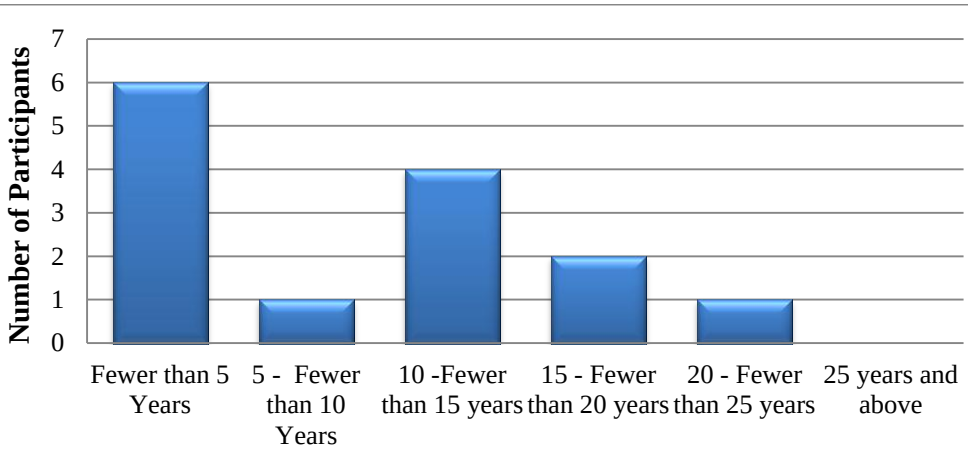


Figure 4.10 Design-Build



4.11 Build-Operate-Transfer (BOT)

4. 1. 4. Delivery Methods used in Municipal Projects

Prior to the research study, it had been generally assumed that municipalities were only utilizing the traditional DBB delivery method for all types of municipality project. This was because all municipal projects must follow the Saudi government project procurement regulations. However, following the interviews and after clarification from

the respondents, the data revealed that most municipalities have used, are currently using, or are planning to use all four types of delivery method. It was evident, however, that the implementation of the different delivery methods was not proceeding strictly in accordance with 'textbook' recommendations and recognized international standard practice. In general, we can say that DBB is the dominant delivery method in the vast majority of Amanah projects. Figure 4.12 below shows the percentage of municipal projects utilizing each of the four types of delivery method.

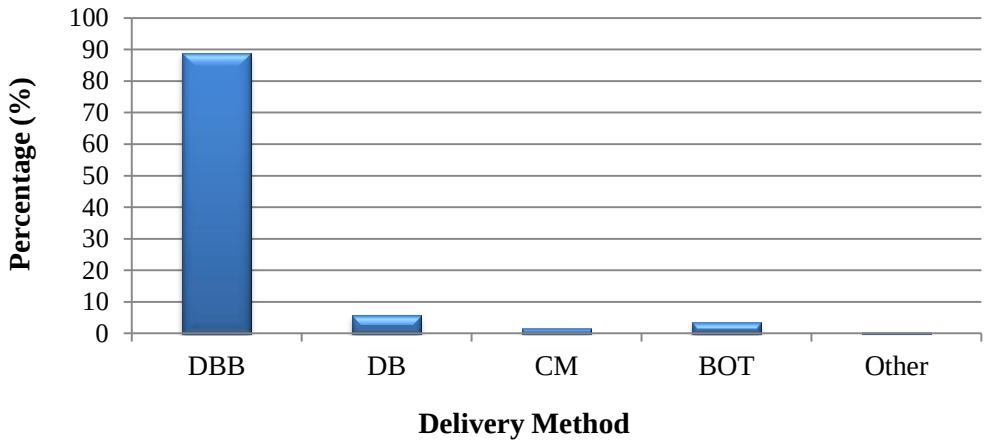


Figure 4.12 Delivery Method Used for Municipal Projects

4. 2. Types of Amanah Project

This section presents information about the types of Amanah project that have been completed over the past decade. It also presents background information about the different life cycle phases that these projects went through, from the initiation phase to the completion phase. Amanah projects are usually service projects in nature, serving the communities in which they exist. As such, the types of project undertaken are common to all areas and focus on roads, tunnels, bridges, landscape and beautification (site development) projects, storm drainage, asphalting, walkways, and so forth.

The survey feedback revealed that new within-city road/street projects represent the largest single category of projects, accounting for 35.1% of all Amanah projects. This is followed by asphalting, walkways and lighting projects, which comprise more than 19.8% of the total. Table 4.02 below shows the types of project that have been undertaken by the Amanahs over the past decade:

Type of Project	Percentage (%)
New Roads/Streets (within cities)	35.1%
Tunnels	3.7%
Bridges	4.7%
Landscape Projects	5.7%
Beautification Projects (site development)	5.3%
Storm Drainage Projects	12.4%
Asphalting, Walkways and Lighting	19.8%
Operational and Maintenance Projects	11.3%
Other (Buildings)	2.1%
TOTAL	100.0%

Table 4.02 Types of Amanah Projects

The completed projects, regardless of their type, have mainly been carried out using the DBB project delivery method. Less than 15% of the projects were completed using one of the alternative project delivery methods. It was evident from the discussions with Amanah officials that they are trying to utilize the Construction Management approach in handling their future projects. This move towards the CM delivery method can be viewed as an attempt to compensate for the lack of technical, construction and management expertise within Amanahs to properly handle these projects. Table 4.03 below shows the delivery methods used for the various types of completed project:

Type of project	Delivery Method			
	DBB	**DB**	**CM**	**BOT**
New Roads/Streets (within cities)	93%	0%	7%	0%
Tunnels	78%	11%	11%	0%
Bridges	82%	9%	9%	0%
Landscape Projects	85%	7%	8%	0%
Beautification Projects(site development)	72%	14%	7%	7%
Storm Drainage Projects	86%	7%	7%	0%
Asphalting, Walkways and Lighting	87%	6%	7%	0%
Operational and Maintenance Projects	75%	6%	13%	6%
Other (please specify) (Building & Washing)	67%	33%	0%	0%

Table 4.03 Delivery Methods used for Amanah Projects

Furthermore, it was also highlighted during the interviews that in recent years, and especially after the misfortune of the flooding catastrophes that occurred in one of the major cities in Saudi Arabia, Jeddah, in November 2009 and January 2011, project priorities have been shifted to storm drainage projects in order to prevent a reoccurrence of such incidents in any of Saudi Arabia's cities.

4. 3. Life Cycle of Amanah Projects

Amanah projects normally go through different phases, including the initiation of the project idea. These phases include the planning and design phase, the bidding phase, the construction phase and, finally, the completion and closeout phase. All of the respondents were requested to evaluate the extent of the impact of the different project delivery methods on the various phases of a project.

4. 3. 1. Initiation of Projects

During the initiation phase, the need for Amanah projects is usually defined by the master plan of the Amanahs. It is also defined through feedback from the Municipal Council of the particular region or area. On occasion, the regional government mandates certain projects in order to address newly-surfaced issues within cities. However, generally, more than 70% of projects in any given region are defined by the Amanah of the region. It is rare to find outside consultants defining individual projects by themselves, although they sometimes (more than 30% of cases) form a partnership with the Amanahs to study a certain situation and a joint decision is then made to initiate a project, even one beyond the call of a city's master plan.

Once the need for a project is recognized, which in many cases involves equally: addressing current problems, meeting new current demands and visualizing a future vision for the city, projects are then ready for further studies. One of the major activities in the initiation phase of a project is the conducting of a feasibility study. In the case of Amanahs, it was reported that feasibility studies are usually conducted by the individual Amanah (more than 75% of cases). However, since the Amanah projects are service

projects in nature, not much weight is given to the feasibility studies for these projects. Project proposals need to be decided on in a timely manner in order to move on with the process of requesting funds and securing the necessary approvals.

4. 3. 2. Requests for Funds and Project Evaluations

Once the project need has been identified, the necessary feasibility study has been conducted and all of the planning documents have been prepared, Amanahs usually request the project budget from the government. In more than 50% of the completed projects, budgets were requested from the Ministry of Finance (MOF) at 100% completion of project scope through the yearly allocation of the Amanahs' annual projects budget. It was also reported, however, that in 50% of the completed projects, the budget was requested at 30-60% of the scope completion. This is because of the repetitive nature of most Amanah projects, which requires the Amanahs to forecast the quantities needed in order to proceed with projects, assuming the project specifications are known. One approach that is used within Amanahs is to establish a budget per item of work. For instance, an item in the annual budget which is for the asphalting of streets might be enough to complete the asphalting in a number of projects. Thus, funding sometimes is not developed and requested per single project.

The evaluation of the different alternatives is usually performed by MOMRA or designated committees within the Amanahs. On occasion, MOF is additionally involved in evaluating project alternatives. It was highlighted during the interviews that in more than 37% of non-repetitive projects, MOF is the entity responsible for evaluating project alternatives. This is to ensure that Amanahs have considered all possible alternatives so as

to ensure the achievement of cost savings. At the end of the process, MOMRA or one of its Amanahs has the final say on what type of project is to be constructed (for instance, to propose a bridge rather than a tunnel at an intersection within a city), provided that a proper technical justification and rationale statement have been prepared.

Figure 4.13 below shows the percentages accounted for by various evaluating entities in the evaluation of municipal projects:

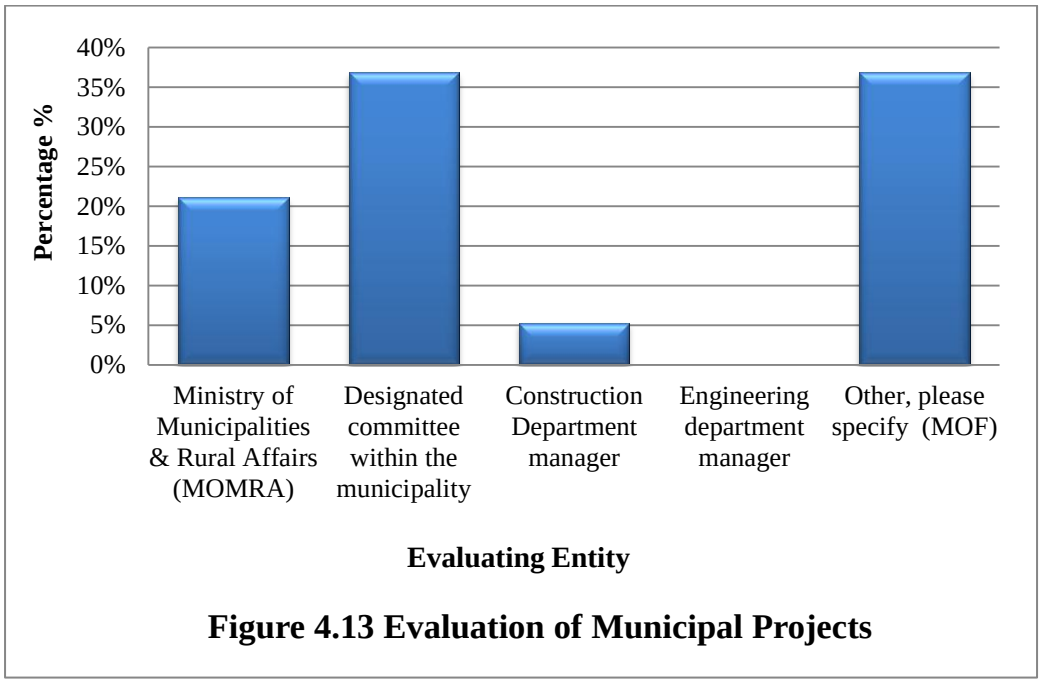


Figure 4.13 Evaluation of Municipal Projects

4. 3. 3. Project Design and Engineering

It is common practice within Amanahs for the project design activities to be performed by Architecture/Engineering firms as part of their outsourcing initiatives. This is because of the lack of technical expertise and knowledge among the Amanahs' staff who are concerned with such projects. In certain types of project and at a lower level, the engineering staff of the Amanah is the entity responsible for the design. Examples of such

projects are the various landscape projects that are undertaken within cities. Again, the regular operation and maintenance contractors take on many of the responsibilities in such design projects, including the preparation of the engineering documents.

It was additionally reported that 80% of the Amanahs that participated in the study are conducting constructability reviews for their project designs in order to avoid conflicts resulting from the non-constructability of a prepared design. Such reviews are usually either performed by different entities within the Amanahs or are outsourced to engineering firms or contractor companies. The reviews are not particularly detailed, but they at least highlight potential areas of conflict which might arise were a design constructability review not conducted. However, 20% of the participating Amanahs, as highlighted by the questionnaire, do not conduct any form of design constructability review for their projects. This is because those Amanahs assume that the contractors who are invited to bid for the projects will carry out this review on their behalf. It is also assumed that all participating contractors will undertake a review of the project design and its associated engineering documents from a constructability perspective and ensure their readiness and capacity to fulfill the requirements of a project as specified in the project documents.

It was also reported during the interviews that Amanah projects are generally repetitive in nature, and so almost all of the contractors are familiar with these Amanah projects. Design firms, being frequently contracted by the Amanahs, are fully aware of Amanah projects and the need for simplicity of design in order to reduce construction costs. Moreover, the participating contractors are almost always the same for all projects; their

capabilities and capacities are therefore well known to the design firms which are hired by the Amanahs.

4. 3. 4. Preparation of Project Tendering (Bidding) Documents

Out of the fourteen (14) respondents who participated in the study, twelve (12) confirmed that tendering documents (bidding documents) are usually required as part of the project package. This represents 86% of the study population, which indicates that the design firm is usually responsible for the entire package, including bidding documents.

4. 3. 5. Awarding (Bidding) Activities

The awarding of Amanah projects using the DBB method takes two forms. Projects are either awarded through open bidding or through closed bidding, depending on the project. Generally speaking, Amanah projects are government projects and, therefore, are offered through an open bidding strategy to ensure fairness and prevent corruption. Figure 4.14 below shows the distribution between the two bidding strategies:

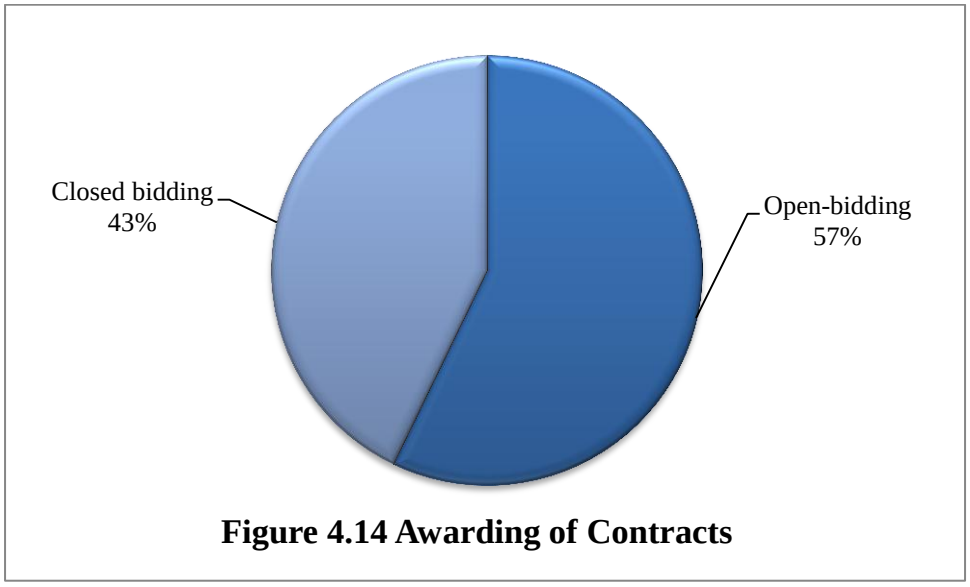


Figure 4.14 Awarding of Contracts

Once the project bid is announced, a bid examination committee and a bid awarding committee will be established. The bid examination committee is responsible for reviewing all submitted bids in accordance with the set requirements. This committee is responsible for reviewing the commercial package received from interested contractors. Based on the recommendations of the bid examination committee, the bid awarding committee will then make the final decision on whom to award the project contract to on the sole basis of the lowest bid price. It is assumed by the various Amanah committees that all interested contractors have complied with the set requirements for a given project.

It is interesting that a number of the Amanahs interviewed have established a computerized database showing all potential contractors who already have existing projects with these Amanahs. This information helps Amanahs to eliminate interested contractors who have consumed some or all of their resources and possibly become limited, in terms of resources, in the handling of more, newer projects. This database therefore helps the Amanahs to be on the alert for contractors whose performance may be sub-par. This practice is in full compliance with article 38 of the Regulation of Government Tender and Procurement Law, which states:

"Without prejudice to the provisions of Article 23 of the Law, the Bid Examination Committee shall, before recommending the exclusion of a bidder whose contractual obligations appear to be beyond his financial or technical capabilities, take the following into consideration:

(a) Ascertaining the volume of the bidder's obligations in relation to the contracts he is executing for the Government Authority or other authorities, the standard of

execution and whether he can execute the project which is the subject of the tender in addition to existing contracts.

(b) Ascertaining his technical expertise and financial capabilities in accordance with the provisions of Paragraphs (b) and (c) of Article 37 of these regulations.

(c) The exclusion shall be based on acceptable substantial grounds, taking into account the interest of the Government Authority, pursuant to a technical report prepared by it.

(d) If the Bid Examination Committee is convinced that the abilities of the bidder do not permit assigning him other works that may affect the execution of his obligations, it may recommend his exclusion from the tender" (MOF, 2007).

4. 3. 6. Construction and Closeout Activities

The analysis of the feedback revealed that 66% of the supervision of Amanah projects was outsourced to either engineering firms or contractors. The remaining 35% of the completed projects were supervised by the construction departments within Amanahs. Figure 4.15 below shows the distribution of supervision of Amanah construction projects. The outsourced projects were the bigger projects and those with a new scope of work. The majority of projects that were supervised by Amanahs' construction teams were those of a repetitive nature and those on a smaller scale, such as minor roads, landscaping and beautification projects, and maintenance work.

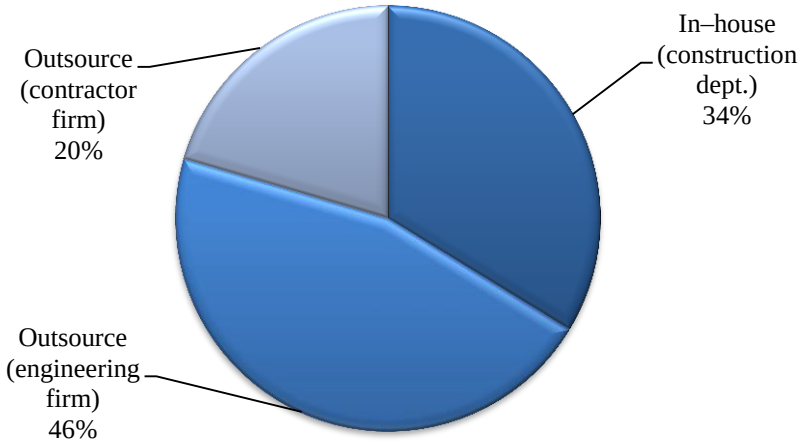


Figure 4.15 Supervision of Amanah Construction Projects

Analysis of the feedback data revealed that construction departments within Amanahs are almost always the entity which decides whether or not projects have been completed as per the bid documents. The analysis indicated that 89% of all completed projects were confirmed by the construction departments within the Amanahs. The remaining 11% of completed projects were confirmed as completed by the engineering firms that were hired to oversee the construction activities of these projects.

4. 4. Effects of DBB on Amanah Project Performance Criteria

This section addresses the effects of the DBB delivery method on the three major objective project performance criteria, namely: Cost, Time and Quality.

In order to determine the effects on each of the three project performance criteria, a list of contributing factors was developed from a comprehensive literature review of relevant journals and textbooks, as well as previous research dissertations. These factors were then categorized for each performance criterion as follows:

Cost Criterion:

- Exceeding the project budget (overrun)
- Meeting the project budget
- Generating cost savings

Time Criterion:

- Exceeding the planned project schedule (overrun)
- Meeting the planned project schedule
- Completing the project ahead of the planned project schedule

Quality Criterion:

- Failing to meet project quality requirements
- Meeting project quality requirements
- Exceeding project quality requirements

Respondents were requested to reflect on their overall experiences with Amanah projects in general and not on a specific project or projects. A five-point Likert scale, ranging from “strongly agree” to “strongly disagree” was used for this purpose.

4. 4. 1. Effects of DBB on Amanah Project Cost

The analysis revealed that 64% of the Amanah projects were completed with actual costs exceeding the initial or planned budgets. The remaining 36% of projects were completed within the budgets allocated for each project. Not a single response highlighted the achievement of a cost saving in an Amanah project.

It is important to highlight that an "allowable cost overrun" is defined as not exceeding the 10% allowable increment over and above the project budget. In cases where more than 10% is needed to complete the project, ancillary projects may be established in order to channel extra funds to the main project. On the other hand, a cost saving is achieved when the project is completed for less than the planned budget to a maximum of 20%. According to the interview data however, cost savings are unheard of in respect of Amanah projects.

The main factors contributing to the excess costs in respect of completed Amanah projects are reported in Table 4.04 below as follows:

Rank	Factor	Weighted Average (out of 5.00)
1	Bureaucracy of government systems	4.33
2	Price inflation of construction materials	4.11
3	Poorly-developed plans and specifications	4.00
4	Variations demanded by the municipality (client)	3.89
5	Constructability issues	3.67

Table 4.04 Most Important Factors Leading to Project Cost Overrun

As can be seen from Table 4.04, the bureaucracy of government systems was the number one factor. An example of such bureaucracy, as reported by respondents, is in the

improper evaluation and allocation of project budgets by the Ministry of Finance (MOF). It seems that bureaucracy is built into government procedures in order to permit a greater degree of control over financial transactions and prevent the misuse of government funds, thus ensuring that projects are planned and requested for genuine and urgent needs. By contrast, the bureaucracy that exists within and across service organizations might be the result of dilution and poor coordination of roles and responsibilities. For example, some Amanah projects are delayed as a result of existing underground utilities that were not accounted for during the preparation of project documents. It will inevitably take time – which translates into additional costs – to make decisions regarding the relocation of this utility infrastructure. In conclusion, the issue of bureaucracy impacts negatively on the efficient handling of Amanah projects.

The issue of bureaucracy is followed in importance by price inflation of the construction materials during the actual execution of the project. This factor, viewed from the perspective of the researcher, is a result of the time span, or lag, between the completion of the project package, the submission of the request for project funding from the MOF and the start of the construction works. Adjustments for inflation might not be seriously considered during the funding request – a scenario which will have a negative impact on the overall cost of project materials and, very likely, on the cost of labor and equipment.

Poorly-developed plans and specifications, as prepared by the contracted engineering firms, is the third major factor that was found to affect the overall project cost. The reason for the occurrence of this factor became evident during the interviews, where major concerns were raised by a number of Amanahs regarding the qualifications of the

engineering firms who prepared the project design and construction documents. Variations in the scope of the project demanded by the Amanahs, as well as constructability issues encountered during construction are also considered to be major factors resulting in project cost overrun. With regard to the variations requested by Amanahs, it seems that requirements are subject to change from the initiation of the project idea to actual project construction. These changes are initiated, as highlighted during the interviews, to address certain important issues related to the practicality of the project. It was also highlighted during the interviews that it is extremely rare to find an Amanah project which has been executed without changes being made during the construction phase. The constructability issue is an expected concern, as the project design is not benefiting from the construction experience; an issue commonly reported in connection with use of the DBB delivery method. Again, this has to do with the concerns over the qualifications of engineering firms that were reported earlier in connection with poorly-developed project plans and specifications.

Table 4.05 below shows the least important of the factors contributing to Amanah project budget overruns.

Rank	Factor	Weighted Average (out of 5.00)
1	Tight project schedule	2.44
2	Inadequate program scheduling	2.78
3	Design variations (changes in scope)	2.89
4	Extension of project duration	2.89
5	Occurrence of claims and disputes	3.11
6	Incomplete or inaccurate cost estimates	3.11

Table 4.05 Least Important Factors in Project Cost Overrun

As can be seen from Table 4.05 above, Amanahs perceive the initial project schedules, as well as inadequate program scheduling, as minor factors contributing to project cost overrun. This might be due to the fact that time floats have always been built into the original project schedule, resulting in more time being allocated for a project than is necessary for its completion. Furthermore, the analysis shows that Amanahs are making relatively few major changes to the original project design – a finding which is expected, given that basic Amanah projects such as asphalting, within-city roads, gardening and landscape projects and so forth are common in nature and their scope is clear.

Amanah projects sometimes require a longer timeframe than originally planned. However, as reported by the Amanahs, this seems to have no significant effect on cost (i.e. overrun). Respondents cited the fact that Amanah projects have been completed with actual costs exceeding the allocated project budgets. However, contractors bear the burden of any additional costs associated with project delay. Furthermore, the respondents highlighted that the occurrence of claims and disputes, as well as incomplete or inaccurate cost estimates, are not major factors in project cost overrun. For the 36% of projects which were completed within the allocated budget, the following factors were identified as key:

Rank	Factor	Weighted Average (out of 5.00)
1	Accurate cost estimates	4.60
2	Cooperative relationships among all parties	4.60
3	Abiding by the original design scope	4.40
4	Proper municipality supervision	4.40
5	Contractor Experience	4.40
6	Well-developed plans and specifications	4.40
7	Involved parties' knowledge of DBB	4.40

Table 4.06 Most Important Factors in Meeting Project Budgets

Accurate cost estimates and cooperative relationships among all parties involved in a project make a significant contribution to the meeting of project budgets. This finding contradicts the feedback gathered from the respondents who failed to meet the original project budgets. It also negates the general understanding of the DBB delivery method as tending to create adversarial relationships among stakeholders. Adherence to the original design scope, proper municipality supervision and sufficient contractor experience are factors which were reported as having contributed to on-budget project completion. Well-developed plans and specifications, as well as the participants' knowledge of the DBB delivery method were found to contribute significantly in respect of Amanahs meeting the original project budget. This finding would appear to be realistic, as Amanah projects are repetitive in nature and tend to employ the same contractors.

A significant difference was found between the responses from those who completed the Amanah projects with actual costs exceeding the initial or planned budgets and those who completed the Amanah projects within the budgets allocated for each project. The *p*-value was calculated for the means of the factors using the Microsoft Excel® application in order to verify the significance of this variance among responses and to ensure the reliability of the data. Using a *z*-test from the Microsoft Excel® application for the factor means, the *p*-value was found to be $<<0.05$. This indicates that the powers of the factors contributing to cost overruns and the factors contributing to Amanahs meeting the allocated budgets are significantly different. This finding confirms that the factors causing the cost overruns are indeed real. It is noteworthy that the factors which were found to

result in excess costs and the factors which were found to lead to project budgets being met are not the same, nor are they exact opposites. In general, however, the two groups of factors are clearly divergent.

4. 4. 2. Effects of DBB on Amanah Project Time

Amanah projects are usually completed later than the deadlines set for their completion; analysis of the relevant data revealed that 64% of the Amanah projects were completed later than the completion deadlines. These delays were caused by a number of factors of varying weights (Table 4.07 below). As reported in the questionnaire survey and confirmed in the face-to-face interviews, change orders by Amanahs emerged as the chief factor in project completion delays. These change orders were requested either to address a modification to an existing requirement of the project or to modify the design in the light of changing requirements – a scenario that could potentially emerge in any given project.

This is followed in importance by corrective works carried out on completed activities in order to have them conform to the specified requirements. This appears to occur as a result of the inadequate qualifications of contractors or the low level of competence of laborers. Major changes to the original design, as well as poorly-developed project plans and specifications were also ranked highly by Amanah respondents among the various factors causing project delays.

Rank	Factor	Weighted Average (out of 5.00)
1	Change orders	4.00
2	Corrective works (re-work)	3.67
3	Major changes to original design	3.67
4	Poorly-developed plans and specifications	3.67

Table 4.07 Most Important Factors Leading to Project Time Overruns

The analysis showed that the least important factors contributing to delays in Amanah projects were involved parties' lack of knowledge of the DBB delivery method and unclear project scope. Evidently, these two factors – shown in Table 4.08 below – are not having a major impact on the completion times of Amanah projects. This finding is to be expected from a review of the relevant literature on the DBB delivery method and is consistent with the earlier findings related to the repetitive nature of Amanah projects.

Rank	Factor	Weighted Average (out of 5.00)
1	Involved parties' lack of knowledge of DBB	2.14
2	Unclear project scope	2.67

Table 4.08 Least Important Factors in Project Time overruns

As Table 4.09 below shows, a cooperative relationship among all parties was identified as the most important factor in meeting project deadlines. A clear project scope and proper municipality supervision were highlighted as the next most important factors.

Rank	Factor	Weighted Average (out of 5.00)
1	Cooperative relationship among all parties	5.00
2	Clear project scope	4.75
3	Proper municipality supervision	4.75

Table 4.09 Most Important Factors in Meeting Project Deadlines

Only one respondent reported that projects were usually completed ahead of the deadline. This represents only 7% of the total number of respondents.

A significant difference was found between the responses from those who completed the Amanah projects with actual project duration exceeding the initial or planned duration and those who completed the Amanah projects within the time allocated for each project.

As with the analysis of cost, the *p*-value was calculated for the means of the factors using the Microsoft Excel® application in order to verify the significance of this variance among responses and to ensure the reliability of the data. Using a *z*-test from the Microsoft Excel® application for the factor means, the *p*-value was found to be <<0.05. This indicates that the powers of the factors contributing to time overruns and the factors contributing to projects meeting the allocated timescales are significantly different. This finding confirms that the factors causing the delays are indeed real. It is noteworthy that the factors which were found to cause delays and the factors which were found to lead to project deadlines being met are not the same, nor are they exact opposites. In general, however, the two groups of factors are clearly divergent.

4. 4. 3. Effects of DBB on Amanah Project Quality

The analysis of the effects of the DBB delivery method on the quality of Amanah projects revealed that completed projects either failed to meet the required quality specifications set for them or barely met the specified quality requirements mandated by the project documents. Not a single response highlighted the achievement of a level of quality over and above that set for each Amanah project.

In fact, the majority of completed Amanah projects (64%) failed to meet project quality requirements. Respondents reported that the remaining 36% of completed projects met the specified quality requirements for each project.

As reported in the questionnaire survey and confirmed in the face-to-face interviews, project quality issues are the result of a number of factors, shown in Table 4.10 below:

Rank	Factor	Weighted Average (out of 5.00)
1	Under-qualified contractors	4.78
2	Insufficiency of skilled labor	4.67
3	Low management competency of subcontractors	4.67
4	Poorly-developed plans and specifications	4.33
5	Poor municipality supervision and lack of experience	4.33

Table 4.10 Most Important Factors Leading to Amanah Project Quality Failure

The use of under-qualified contractors emerged as the chief factor leading to a failure to meet the required project quality requirements. This factor was reported in the face-to-face interviews as the major issue that Amanahs are encountering when dealing with contractors who are improperly classified by the government classification entity. This is followed in importance by an insufficiency of skilled labor in the construction industry in

Saudi Arabia in relation to the quality requirements of projects. This issue has to do with the absence of training and certification of trade laborers in Saudi Arabia, and applies to both domestic and expatriate workforces. Low management competency of subcontractors who are hired to participate in a project also plays a major role in quality failure. Also of concern is the Amanahs' awarding of additional projects to qualified contractors who are fully extended to their maximum resource capacity. These contractors tend to sub-contract the new projects either to less-qualified contractors or to contractors who are completely unqualified to undertake such projects. This inevitably results in a failure to achieve the desired project quality standards. Poorly-developed plans and specifications, as well as poor municipality supervision and a lack of supervisory experience were also ranked highly by Amanah respondents as factors causing projects to fall short of the required quality standards.

Table 4.11 below shows the least important of the factors contributing to Amanah project quality failure.

Rank	Factor	Weighted Average (out of 5.00)
1	Complexity of the project	3.00
2	High performance or quality expectations	3.22
3	Unsuitable construction program planning	3.33
4	Variations in construction programs	3.33
5	Tight project schedules	3.33

Table 4.11 Least Important Factors Leading to Amanah Project Quality Failure

Due to the nature and complexity of Amanah projects, it was to be expected that the Amanah project scopes are not complex and would not contribute to the failure of a project to meet its quality requirements. High performance or quality expectations were

not major factors reported to cause a project to fail to meet the desired quality standards. Unsuitable construction program planning, variations in construction programs and tight project schedules are also considered among the least important factors leading to Amanah project quality failure. It seems that all three parties involved in a project, namely, the Amanahs, design firms and contractors are following a similar, repetitive approach in dealing with projects and so become increasingly comfortable with the handling of these projects.

For the 36% of completed projects meeting the quality requirements set for them, the following factors were identified as key:

Rank	Factor	Weighted Average (out of 5.00)
1	Cooperative relationships among all parties	5.00
2	Abiding by the original design scope	4.60
3	Proper municipality supervision	4.60
4	Applying innovative construction methods	4.20
5	Well-developed plans and specifications	4.20
6	Contractor Construction experience	4.20
7	Proper contractor supervision	4.00
8	Minimal design changes	4.00
9	Appropriate selection of subs and suppliers	3.60

Table 4.12 Most Important Factors in Meeting Project Quality Requirements

As can be seen from Table 4.12, the chief factor that was identified in the analysis as enabling the meeting of project quality requirements is the existence of cooperative relationships between all involved parties. It is of course only to be expected that cooperative relationships will facilitate a desirable outcome in any given project. The other major factors highlighted in Table 4.12 were also identified as enablers in the meeting of project quality requirements.

A significant difference was found between the responses from those Amanahs that claimed that the quality requirements set for each project were met and those that acknowledged a failure to meet the quality requirements set for each project. The *p*-value was calculated for the means of the factors using the Microsoft Excel® application in order to verify the significance of this variance among responses and to ensure the reliability of the data. Using a *z*-test from the Microsoft Excel® application for the factor means, the *p*-value was found to be $<<0.05$. This indicates that the powers of the factors contributing to a failure to achieve the required quality standards and the powers of the factors contributing to the achievement of the required quality standards are significantly different. This finding confirms that the factors causing the quality failures are indeed real. It is noteworthy that the factors which were found to cause quality failure and the factors which were found to contribute to the achievement of project quality specifications are not the same, nor are they exact opposites. In general, however, the two groups of factors are clearly divergent.

4. 5. DBB from the Perspective of the Amanahs

Through an extensive literature review which included relevant textbooks, journals and previous dissertations, 32 propositional statements related to delivery methods were formulated and included in the survey (see survey question 2.6). Respondents were asked to evaluate, from their experience with Amanah projects using the DBB delivery method, the extent to which they either agree or disagree with these statements using a Likert Scale ranging from 1: "Strongly Disagree" to 5: "Strongly Agree."

In addition to presenting the reported strengths and weaknesses of known delivery methods (DBB, DB, CM and BOT), the statements outline the circumstances in which the various delivery methods could be utilized to suit project conditions. The propositional statements were arranged in a random manner with the objective of not guiding the respondents to particular answers or evaluations. Table 4.15 shows all 32 statements, ranked from those generating the highest level of agreement to those generating the lowest level of agreement.

Among the 32 statements listed, one statement was repeated with a very slight difference in wording. This repetition was intended to enable the researcher to assess the level of consistency and focus in the response ratings given in this section of the questionnaire. Analysis of the feedback data revealed that those two statements were ranked very closely, which indicates that respondents were consistent in their ranking of the statements. The two statements are shown below:

Rank	Statement	Weighted Average (Out of 5.00)
1	Provides Amanahs (municipalities) with significant control over the end product.	4.00
2	Provides the project owner (municipality) with a significant amount of control over the design of the end product.	3.80

It is worth noting that the top ten (10) ranked statements (Table 4.13 below) conform to the general understanding of and received wisdom on the use of the DBB delivery method.

Rank	Statement	Weighted Average (Out of 5.00)
1	Allows owner (Amanah) to have control over change orders.	4.07
2	Isolates the design and construction activities.	4.07
3	Stimulates competition in the bidding process for municipal projects.	4.00
4	Provides Amanahs (municipalities) with significant control over the end product.	4.00
5	Requires the owner (Amanah) to have technical expertise.	4.00
6	Requires a higher level of inspection by the Amanah (municipality) to achieve cost containment.	3.93
7	Is easily understood.	3.86
8	Provides the project owner (municipality) with a significant amount of control over the design of the end product.	3.80
9	Defines clearly the required insurance and bonds.	3.79
10	Furnishes well-established legal precedents as a result of previous litigation.	3.79

Table 4.13 Top-Ranked Propositional Statements Related to DBB

These ten (10) statements could be classified as strengths or weakness, depending on the parties involved in the project. For example, the DBB delivery method allows the owner (the Amanah) to have control over change orders. Viewed from the perspective of the Amanah, this is perceived as a major strength, as control over change orders will furnish an Amanah with extra flexibility and a greater degree of control over the end product. In contrast, owner control over change orders is not perceived as a strength from the perspective of the contractor, as Amanahs might create many change orders, which will

likely result in delays, cost overrun and possible claims or disputes if not handled properly.

Another weakness of the DBB delivery method, as reported in the literature review and confirmed by this study, is the isolation or separation of the design activities from the construction activities. This separation occurs as a result of the sequencing of activities, as bidding does not materialize unless the design and all project documents are fully completed. Again, construction will only commence once the project contract is awarded. This is a major weakness from the perspective of both the Amanah and the contractor who is awarded the contract, as the design does not benefit from the field construction experience.

The third most highly-ranked statement, which is considered to be one of the strengths of the DBB delivery method, is that DBB stimulates competition in the bidding process, which will yield the lowest project price. However, this purported strength could be seen as a burden on the Amanah if the lowest bidder is not qualified, as was reported in the face-to-face interviews. Contractors tend to view competition as a threat, as they have to reduce their profit margins to a bare minimum. In the worst case scenario, contracts may be awarded to contractors who do not perform proper cost estimates in their bidding, and this may result in genuine competitors losing contracts.

Another strength perceived by Amanahs is that the DBB delivery method provides them with a significant degree of control over the end product. However, this might not be the case when viewed from the contractor's perspective.

The DBB delivery method requires the owner (the Amanah) to have the technical expertise to oversee the activities through the life cycle of the project. It also requires a higher level of inspection by the Amanah in order to achieve cost containment. In cases in which the Amanah does not have the required technical expertise however, this responsibility for oversight becomes a burden and may be viewed as a major weakness of using the DBB delivery method. It might have a further negative impact on the quality of the project in cases where a weak contractor is awarded the project. The DBB delivery method is therefore not an appropriate delivery method in the absence of either in-house or outsourced technical expertise in respect of Amanah projects.

A commonly-perceived strength of DBB is that it is very easy to understand. This high level of understanding among all parties involved in a given project is a result of the many years' experience of implementing this delivery method for both government and non-government projects. As was highlighted in the report, the DBB delivery method is used for approximately 90% of Amanah projects. It is well known that DBB provides the project owner (municipality) with a significant amount of control over both the design of the project and the overall end product. It is therefore unsurprising that the foregoing analysis has confirmed this understanding of DBB.

Finally, the analysis revealed that DBB clearly defines the required insurance and bonds and furnishes well-established legal precedents as a result of previous litigation. As confirmed by the experience of all parties, the DBB delivery method offers a great deal of clarity when it comes to the insurance and the various bonds required for a given project. The study additionally highlighted the fact that DBB has a major drawback related to the

location of responsibility for a project, as it does not provide a single point of responsibility for the owner. As was anticipated, therefore, the study has confirmed these essential aspects of the DBB delivery method.

On the other hand, several known weaknesses in respect of DBB were not identified by respondents as weaknesses in the Amanahs' use of this delivery method, as can be seen in Table 4.14 below. An example of this is the statement: "DBB tends to create adversarial relationships among the contracting parties, rather than fostering a cooperative atmosphere in which issues can be resolved efficiently and effectively." This statement was rated as "neutral," which indicates that relationships among contracting parties are not being negatively affected by the use of the DBB delivery method in Amanah projects.

Another statement that was rated as "neutral" was that relating to the allocation of project risk. Although the DBB delivery method is believed to relieve contractors of any risk associated with the project, respondent feedback suggested otherwise. This apparent anomaly can perhaps be understood from the fact that Amanah projects, being government projects, may allow Amanahs an additional degree of power over contractors and so subsequent risks will continue to be borne by contractors, regardless of the circumstances.

Rank	Statement	Weighted Average (Out of 5.00)
28	Provides a single point of responsibility for the project.	2.79
29	Tends to create adversarial relationships among the contracting parties, rather than fostering a cooperative atmosphere in which issues can be resolved efficiently and effectively	2.79
30	Provides incentives for contractors to use innovative approaches to reduce project costs.	2.79
31	Provides incentives for contractors to use innovative approaches to reduce project duration.	2.64
32	Transfers project risk to contractors	2.36

Table 4.14 Low-Ranked Propositional Statements Related to DBB

Two more statements were ranked very lowly by the respondents, as can be seen in Table 4.14 above. These two statements, which relate to the inclusion of incentive provisions in the contract to incentivize contractors to use innovative approaches in order to reduce project costs and duration, are in fact perfectly valid statements. This issue is not directly related or limited to the DBB delivery method, but is rather a general issue that needs to be addressed with a view to improving construction industry practices in Saudi Arabia.

Rank	Statement	Weighted Average (Out of 5.00)
1	Allows owner (Amanah) to have control over change orders.	4.07
2	Isolates the design and construction activities.	4.07
3	Stimulates competition in the bidding process for municipal projects.	4.00
4	Requires the owner (Amanah) to have technical expertise.	4.00
5	Provides Amanahs (municipalities) with significant control over the end product.	4.00
6	Requires a higher level of inspection by the Amanah (municipality) to achieve cost containment.	3.93
7	Is easily understood.	3.86
8	Provides the project owner (municipality) with a significant amount of control over the design of the end product.	3.80
9	Defines clearly the required insurance and bonds.	3.79
10	Furnishes well-established legal precedents as a result of previous litigation.	3.79
11	Lacks built-in incentives for contractors to provide enhanced performance (cost, time, quality, or combination thereof)	3.79
12	Maintains the project risk with Amanahs (municipalities)	3.79
13	Provides a well-established relationship which clearly states the roles and responsibilities of all parties involved in the project.	3.71
14	Provides the project owner (municipality) with a significant amount of control over the end product during the construction process.	3.71
15	exposes the municipality to claims related to design and constructability issues	3.71
16	Furnishes fair competition among all contractors.	3.64
17	Is time-consuming.	3.64
18	Clearly defines roles for all parties.	3.64
19	Results in the greatest potential for cost/time overrun (in comparison to other delivery methods)	3.64
20	Discourages favoritism when spending public funds.	3.57
21	Provides the lowest initial price that responsible, competitive bidders can offer.	3.50
22	Is widely applicable to all municipal projects.	3.50
23	Eliminates legal barriers in procurement and licensing.	3.43
24	Encourages cooperation between all parties in the project.	3.07
25	Lacks input from the construction industry during the design stage.	2.93
26	Results in adversarial relationships between owner, contractor and designer.	2.86
27	Secures minimum quality requirements	2.86
28	Provides a single point of responsibility for the project.	2.79
29	Tends to create adversarial relationships among the contracting parties, rather than fostering a cooperative atmosphere in which issues can be resolved efficiently and effectively	2.79
30	Provides incentives for contractors to use innovative approaches to reduce project costs.	2.79
31	Provides incentives for contractors to use innovative approaches to reduce project duration.	2.64
32	Transfers project risk to contractors	2.36

Table 4.15 Propositional Statements Related to DBB

4. 6. Key Issues Affecting Amanah Projects

In this section of the questionnaire survey, respondents were requested to share their experiences with regard to the key issues that Amanahs are encountering in the course of their projects. This section highlights, from a practical perspective, several measures that could be taken to address these issues. The issues, together with the potential solutions proposed by the respondents, are grouped under various headings below:

4. 6. 1. Amanah Contracts

Issue # 1:

Awarding the project contract to the lowest bidder, as mandated by the government regulations.

Suggested solutions:

- Only award Amanah contracts to bids within ± 10% of the Amanah project cost estimate. Any bid exceeding the Amanah project cost estimate by more than 10% or coming in at more than 10% under the Amanah project cost estimate should be eliminated from the awarding process.
- Change the bill of quantities to include only the known estimated costs per item. Contractors may increase or decrease the total price of the contract by an approximate percentage to minimize differences among bidders.

Issue # 2:

Lack of incentives within government (Amanah) contracts.

Suggested solution:

- Amanahs may need to consider, within the existing regulatory framework, introducing incentives and penalties for contractors with regard to meeting the three project performance criteria, namely, cost, time and quality. For example, rewarding contractors who complete projects ahead of schedule.

4. 6. 2. Capacity Limitations of Contractors

Issue # 1:

It was reported in the response data that Amanah project contracts are sometimes awarded to contractors with many projects on hand and limited resource capacity, with resulting delays, cost overruns and quality issues.

Suggested solution:

- MOMRA may need to introduce a database showing the current projects of all contractors and the cost (value) of projects on hand, highlighting the percentage of the project achieved in each case. This is to ensure that contractors will be awarded contracts in accordance with their maximum capacity and capability.

4. 6. 3. Qualifications and Classification of Contractors

Issue # 1:

Amanah project contracts are frequently awarded to under-qualified or inexperienced contractors.

Suggested solution:

- It was recommended that the awarding of a contract not be based solely on the financial package (i.e. the contract price). A technical package should be requested from all bidders and, based on its evaluation, only qualified contractors should be considered for the project. It is recommended that weights be established for both the technical and the financial packages (for example, the technical package 30% and the financial package 70%). The bidder with the best overall percentage should be awarded the contract.

Issue # 2:

The practice of awarding Amanah projects to the lowest bidder without considering either the contractor's lack of experience or the capability and capacity of the contractor to undertake the project.

Suggested solution:

- MOMRA may opt to implement a contractor qualification system prior to the awarding of an Amanah contract. This can be achieved through consideration of both the technical and financial packages.

Issue # 3:

Some contractors are currently classified more highly than is justified.

Suggested solution:

- MOMRA or some other designated entity may wish to reconsider the classification of contractors. The designated entity should introduce regress criteria and accurate measurement tools in order to regularly examine the contractors' capability, capacity and previous experience prior to their classification. The review should also consider the qualifications of available contractor manpower.

4. 6. 4. Lack or Absence of Necessary Documentation

Issue # 1:

The presence of undocumented underground utility infrastructure such as power lines, communication cables, sewage pipes, and so forth which are only visible at the construction stage. This is usually due to the unavailability of "as-built drawings."

Suggested solution:

- The government might mandate that all concerned service entities co-ordinate the re-arrangement of utility infrastructure in order to ensure the removal of obstacles that obstruct projects. It is strongly recommended that service entities develop "as-

built drawings" for all underground utility infrastructure and maintain regular updates.

4. 6. 5. Quality of Engineering Firms

Issue # 1:

The questionable standard of engineering firms.

Suggested solution:

- The government or the Saudi Engineering Society – the designated organization with responsibility – should take steps to ensure the competence of all engineering firms operating in Saudi Arabia in order that these firms deliver higher standards of quality to Amanahs and the Kingdom at large.

Issue # 2:

The prevalence of poorly-developed project documents, such as specifications, bills of quantities, detailed drawings and site condition reports including documentation related to underground utility infrastructure.

Suggested solution:

- Municipalities should hire experienced and qualified engineering firms to conduct studies and reviews in respect of all project documents.

CHAPTER 5: SUMMARY AND RECOMMENDATIONS

This chapter presents:

- A summary of the study
- A summary of the data-gathering and respondent profiles
- A summary of the study's major findings
- Recommendations to MOMRA and Amanahs
- Recommendations for further research studies

5. 1. Summary of the Study

Project delivery methods are based on the contractual and organizational arrangements that manage and control the relationships between the various parties involved in a given building project. The planning and construction of any new building requires the continuous collaboration of parties from different specialty, knowledge and skill areas. Historically, early construction methods were primitive but effective in that they successfully translated a client's vision into a completed project. As modern technology replaced the older methods of these early builders, different types of construction, together with the skill sets and specialized knowledge required for completion were needed to keep pace with the changes.

This study has investigated the effects of the DBB delivery method on municipal projects in respect of the three project performance criteria, namely, cost, time and quality. It has additionally identified the specific factors which contribute to the meeting of, and failure to meet, the desired objectives of each performance criterion. The study has also

investigated the various processes currently implemented by Amanahs in their undertaking of projects. This investigation encompassed the full project life cycle, starting from the initial idea and continuing through to the closeout phase.

A comprehensive questionnaire survey was developed and subsequently validated by various specialist audiences in order to ensure the appropriateness of its language and technical content. This was then utilized to document the practical experiences of Saudi Arabia's Amanahs in their use of the DBB delivery method in construction projects. This data-gathering tool was also used to facilitate the face-to-face interviews and telephone interviews, as well as the mailed survey.

The collected data was analyzed using Microsoft Excel® software in order to compute descriptive measures such as the measure of central tendency, the mean, the median and the mode. Additionally, the analysis covered measures of variation including, but not limited to, the variance and standard deviation and *z*-test scores. Correlations between variables were investigated as deemed necessary.

Finally, the key factors which have resulted in the Amanahs exceeding, meeting or failing to achieve performance objectives in respect of project cost, time and quality were identified, along with their significance in terms of weighting.

5. 2. Summary of Data-Gathering and Respondent Profiles

- All sixteen of Saudi Arabia's Amanahs were contacted and invited to participate in the study. Of these, fourteen (14) Amanahs, including all of the major Amanahs (Al Riyadh, Jeddah, Makkah, Eastern Province, Al Madina, Qassim, Al Hasa and Al Taif), participated in the study. This number corresponds to 87.5% of the total population, which represents a satisfactory response rate for such a research study.
- The data was gathered through three (3) modes: face-to-face interviews, telephone interviews and mailed surveys. Amanahs were first contracted and briefed about the study. This initial contact was followed by the sending of the electronic questionnaires in both Arabic and English to facilitate the respondents' data preparation.
- All of the participants who completed the questionnaires hold Bachelor's degrees in study majors (Civil Engineering, Architectural Engineering and Architecture) relevant to the construction industry. Five (5) of the participants additionally hold Master's degrees in Construction Engineering and Management. Participants varied with regard to their level of knowledge of the various project delivery methods, as can be seen from Figures 4.04, 4.05, 4.06 and 4.07.
- The participants' experience (specifically) in municipal projects varies from more than five (5) years at the lower end to over twenty-five (25), which indicates that none of the participants is new to the business of municipal projects. As we have seen from Figure 4.02, eleven (11) participants have more than fifteen (15) years' experience in such projects, which, from the perspective of the researcher, reflects positively on the overall quality of the feedback data from the survey participants.

- In general, Amanah projects are repetitive in nature. Problems encountered by Amanahs are therefore invariably similar. These project types include roads, tunnels, bridges, beautification projects and storm drainage projects (Table 4.02). In recent years, and especially following the flooding crisis in Jeddah in 2009, there has been a clear shift in the nature of Amanah construction projects; from roads and bridges to increasing numbers of storm drainage projects in order to avoid reoccurrences of floods in other cities within Saudi Arabia.

5. 3. Summary of the Study's Major Findings

- Evidently, and as was anticipated, DBB is the dominant delivery method in the vast majority of Amanah construction projects (Figure 4.12). This is due to the fact that Amanahs, being government entities, are legally bound to follow government procurement regulations. As a result, the DBB delivery method has become very familiar to design firms, contractors, subcontractors, suppliers and other parties who are usually involved in a given project. The Construction Management (CM) "Advisory Role" delivery method has gained a good deal of popularity over the past several years. The DB delivery method is known in principle but rarely utilized in Amanah projects. The BOT delivery method is commonly used by all Amanahs for investment projects, but is never used for infrastructure projects.
- Project funds are requested at different stages of scope completion. For repetitive projects, the project fund is requested at 30%-60% of scope completion, whereas, in the case of large projects, the funds are requested at 100% of scope completion.
- Feasibility studies are conducted for Amanah projects. However, since Amanah projects are essentially service projects, very little attention is given to the outcomes of these feasibility studies.
- Design and Engineering firms are required to produce bidding documents as part of the project package.
- Both open and closed bidding strategies are utilized in Amanah projects. However, in order to ensure fairness, it was found that 60% of completed projects were awarded through open bidding. As reported by the Amanah participants, this practice has sometimes resulted in Amanahs awarding project contracts to under-qualified or

inexperienced contractors, which then negatively impacts project cost, duration and quality.

- Although it is clear from Article 38 of the Regulation of Government Tender and Procurement Law that Amanahs, through the bid-examination committee, can recommend the exclusion of bidders whose contractual obligations appear to be beyond their financial or technical capabilities, it appears that Amanahs are not benefiting from this flexibility in the regulations which would allow them not to award contracts to unqualified bidders.
- Amanah contracts are awarded solely on the basis of the financial package without regard to the need for interested contractors to submit a technical package. Therefore, the awarding of Amanah contracts is currently based on the lowest bid price.
- Amanah projects are completed with actual costs either meeting or exceeding the initial or planned budgets. It was reported that 64% of the completed projects were completed with cost overruns. This was found to be due to a number of factors, including the bureaucracy of government systems, price inflation of construction materials, poorly-developed plans and specifications, variations demanded by the Amanahs and constructability issues (Table 4.05). Project cost overruns should not exceed the allowable 10% of the total project price, as mandated by the regulations.
- Amanah projects are usually completed later than the deadlines set for their completion; analysis of the relevant data revealed that 64% of the Amanah projects were completed later than the completion deadlines. Change orders by Amanahs emerged as the chief factor in project completion delays. This was followed in importance by corrective works carried out on completed activities in order to have

them conform to the specified requirements. Major changes to the original design, as well as poorly-developed project plans and specifications were also ranked highly by Amanah respondents among the various factors causing project delays. These delays were caused by a number of factors of varying weights (Table 4.07).

- In Amanah projects using the DBB delivery method, cooperative relationships among all parties, a clear project scope and proper municipality supervision were highlighted as important factors in the timely completion of projects. This finding, however, appears contrary to the received wisdom regarding the DBB delivery method as being a method that creates adversarial relationships among the contracting parties rather than fostering a cooperative atmosphere in which issues can be resolved efficiently and effectively. The researcher attributes these apparently contrary positions to the repetitiveness of Amanah projects and the relative simplicity of their project scope.
- The analysis of the effects of the DBB delivery method on the quality of Amanah projects revealed that completed projects either failed to meet the required quality specifications set for them or barely met the specified quality requirements mandated by the project documents. Not a single response highlighted the achievement of a level of quality over and above that set for each Amanah project.
- The use of under-qualified contractors emerged as the chief factor leading to a failure to achieve the specified project quality standards. This was followed in importance by an insufficiency of skilled labor in the construction industry in Saudi Arabia in relation to the quality requirements of projects. Low management competency of subcontractors hired to participate in a project also plays a major role in quality failure. Poorly-developed plans and specifications, as well as poor municipality

supervision and a lack of supervisory experience were also ranked highly by Amanah respondents as factors causing projects to fall short of the required quality standards.

- A number of issues were reported by Amanah officials as impacting Amanah construction projects. These are:
    1. The practice of awarding the project contract to the lowest bidder, as mandated by government regulations.
    2. The lack of incentives within government (Amanah) contracts.
    3. The fact that Amanah project contracts are sometimes awarded to contractors with many projects on hand and limited resource capacity, with resulting delays, cost overruns and quality issues.
    4. The fact that Amanah project contracts are frequently awarded to under-qualified or inexperienced contractors.
    5. The fact that some contractors are currently classified more highly than is justified.
    6. The presence of undocumented underground utility infrastructure such as power lines, communication cables, sewage pipes, and so forth which is only visible at the construction stage. This is usually due to the unavailability of "as-built drawings."
    7. The questionable quality standard of engineering firms.
    8. The prevalence of poorly-developed project documents, such as specifications, bills of quantities, detailed drawings and site condition reports including documentation related to underground utility infrastructure.

5. 4. Recommendations to MOMRA and Amanahs

Based on the findings of the study, the following recommendations are made:

1. The DBB delivery method appears to be an appropriate delivery method in view of the repetitive nature of Amanah projects. However, the development of a new model in respect of Amanah projects – one combining the DBB and CM delivery methods – may be worth considering. Essentially, this is to address the technical competence issue of Amanahs' staff in overseeing projects throughout the project life cycle.
2. MOMRA and Amanahs might consider benchmarking with Saudi Aramco in order to benefit from its project management practices and experience when handling projects using the DBB delivery method.
3. MOMRA, in coordination with the Saudi Chamber of Commerce, might consider developing a comprehensive database of contractors in order to help standardize the evaluation process in respect of contractors' technical and financial capacities, capabilities and limitations prior to the awarding of a contract. Currently, some Amanahs are using local databases to track contractors but not to assess their capabilities in regard to the awarding of future projects.
4. In spite of the fact that Amanahs are following the government procurement regulations, it is recommended that they consider the exclusion of contractors whose resources are over-extended and not award them any additional new projects. It is recommended that the technical package of a bid be reviewed prior to a review of the bid's financial package.
5. MOMRA, in coordination with the Society of Saudi Engineers, may wish to conduct a thorough review and assessment of all international and domestic engineering firms

operating in Saudi Arabia to ensure the identification of qualified firms. Amanahs – and subsequently all government-related organizations – will then be in a better position to engage the services of only those partner firms that are suitably qualified to undertake municipal projects.

6. Amanahs may wish to explore the option of using the DB or CM "Agent Role" or "At-Risk" delivery methods in certain projects. Having again reviewed the relevant regulations, the researcher does not foresee any obstacles that would prevent the use of these delivery methods in Amanah projects.
7. Amanahs might wish to consider the wider implementation of Geographical Information Systems (GIS) in the planning phase of construction projects in order to enhance the quality of scientific studies, resource management and development planning.

5. 5. Recommendations for Future Research Studies

This research study has examined the various effects of the DBB delivery method on municipal projects in Saudi Arabia. In order to confirm the findings of this study, projects of other government entities might be similarly examined. If the findings of the current study are indeed confirmed, the following research agenda is recommended:

1. Research on how the DB, CM-Advisory or CM-At-Risk delivery methods may best be implemented in respect of municipal projects, notwithstanding existing government procurement regulations.
2. Research on the introduction of new procedures for awarding government project contracts that emphasize the review of the technical package as a prerequisite for the evaluation of the financial package.
3. Research on additional performance criteria, such as safety, and on subjective performance criteria such as functionality, aesthetics, team members' perspectives on various aspects of project performance, and so forth.
4. Research to a) review the classification criteria for contractors and b) assess the prospects for the introduction of classification criteria for engineering firms. Both focuses would take into consideration international practice, as well as feedback from government projects and would encompass all firms, international and domestic, operating in Saudi Arabia. The research in respect of engineering firms may be conducted in collaboration with the Society of Saudi Engineers.

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APPENDICES

APPENDIX I: English Questionnaire

KING FAHAD UNIVERSITY OF PETROLEUM & MINERALS

College of Environmental Design

Construction Engineering & Management Department

EVALUATING THE EFFECTS OF THE DESIGN-BID-BUILD (DBB) DELIVERY METHOD ON MUNICIPAL PROJECTS IN SAUDI ARABIA

Questionnaire, English Version

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DEFINITIONS AND KEY TERMS USED IN THE SURVEY

Project Delivery Method:

This is defined as the structure of the relationship, roles and responsibilities of the client and owner. The structure of the relationship between the design and construction activities leads to the definition of the delivery method, which could be single responsibility, dual responsibility or triple responsibility.

Design-Bid-Build (DBB):

This is also called the "Traditional" delivery method and revolves around the relationship between two entities in separate contracts with the owner. This delivery method remains the most popular delivery method in the construction industry around the world. It involves two contracts with the client or owner. The first entity that has a contract with the owner is responsible for developing the design and all the bidding documents. The second contract is with the contractor who will perform the actual construction of the project.

Design-Build (DB):

DB is a project delivery method in which the owner, either government or private, procures both design and construction services under a single contract with a single legal entity referred to as the 'design-builder.'

Construction Management (CM):

CM delivery is characterized by a contract between an owner and a construction manager who will be at risk for the final construction cost and schedule. In this agreement, the owner authorizes the construction manager to responsibly manage the details of a project's life cycle to fulfill the owner's objectives.

The rationale of CM is to furnish professional management of all phases of a project's life to an owner whose organization may not have those capabilities.

Build-Operate-Transfer (BOT):

BOT is another delivery method that contemplates a single private entity, typically a consortium of private companies, being responsible and financially liable for performing all or a significant number of functions in connection with a project.

BOT is a delivery/financing system where the private sponsor is responsible for financing, designing and constructing the projects and operating the project for specified period of time (concession period) in order to collect revenues as a means of settling debts and producing a profit. After the end of the concession period, the ownership of the facility is transferred to the government authority.

SECTION 1: General Information about Municipality and Respondent

This section collects the basic information needed to identify the various responses received from municipalities. You are kindly requested to complete this part by either ticking with a check mark (√) in the appropriate box or by filling in your answers in the space provided. Your answer should reflect the actual practices of the municipality you are representing.

All information will be treated with complete confidentiality

1.1 Respondent information:

Name (Optional)	
Department	
Position	
E-mail	
Telephone	
Facsimile	

1.2 What is your education level and education major?

☐ PhD (Doctorate)
Major: .....

☐ Master's degree
Major: .....

☐ Bachelor's degree
Major: .....

☐ Other, please specify
.....

1.3 Please select the municipality you are representing:

☐ Riyadh	☐ Makkah	☐ Jeddah	☐ Medina
☐ Eastern Province	☐ Taif	☐ Al Hasa	☐ Qassim
☐ Asir	☐ Hail	☐ Baha	☐ Tabuk
☐ Jazan	☐ Najran	☐ Jouf	☐ Northern Borders

1.4 Please specify the number of municipalities/sub-municipalities you are currently supervising.

……

1.5 How many years' experience do you have with municipal projects?

☐ Fewer than 5 Years ☐ 5 - 9 Years ☐ 10 - 14 years

☐ 15 - 19 years ☐ 20 - 24 years ☐ 25 years or more

1.6 Are you aware of the known delivery methods that are available for construction projects: DBB, DB, CM and BOT?

☐ Yes

☐ No (please go to section 2 - question 2.1)

1.7 Please rate your knowledge of the different delivery methods using the scale from 1 to 5. Where:

(1: No Awareness, 2: Little Awareness, 3: Moderate Awareness, 4: Fully Aware, 5: Expert)

Delivery Method	Scale				
	1	2	3	4	5
Design-Bid-Build ("Traditional")					
Design-Build					
Construction Management (CM)					
Build-Operate-Transfer (BOT)					
Other (please specify)					

1.8 How many years' experience do you have with project delivery methods? Please tick with a check mark (√) in the appropriate box:

Delivery Method	Fewer than 5 Years	5 - 9 Years	10 - 14 years	15 - 19 years	20 - 24 years	25 years or more
Design-Bid-Build ("Traditional")						
Design-Build						
Construction Management (CM)						
Build-Operate-Transfer (BOT)						
Other (please specify)						

1.9 How many DBB, DB, CM and BOT-related projects did you handle in the last five years?

Delivery Method	Number of projects
Design-Bid-Build ("Traditional")	
Design-Build	
Construction Management (CM)	
Build-Operate-Transfer (BOT)	
Other (please specify)	

1.10 From your experience with municipality projects, what delivery method is usually used, as a percentage (%), for municipal projects?

Delivery Method	Percentage (%)
Design-Bid-Build ("Traditional")	
Design-Build	
Construction Management (CM)	
Build-Operate-Transfer (BOT)	
Other (please specify)	
TOTAL	**100%**

SECTION 2: DBB Project Development

This section seeks data relevant to the nature of projects that have been carried out by the municipality you are representing; the process followed in executing these projects; as well as the problems encountered in respect of the three project value performance criteria ***(TIME, COST AND QUALITY)***. It also aims to evaluate, based on your experience, the strengths and weaknesses of the DBB delivery method in relation to municipal projects.

You are kindly requested to indicate with a check mark (√) where applicable or to complete the required field with the precise information.

2.1 Please classify in % terms the types of project the municipality handles:

Type of Project	Percentage (%)
New Roads/Streets (within cities)	
Tunnels	
Bridges	
Landscape Projects	
Beautification Projects (site development)	
Storm Drainage Projects	
Asphalting, Walkways and Lighting	
Operational and Maintenance Projects	
Other (please specify)	
TOTAL	**100%**

2.2 Please identify by a check mark (√) the type(s) of delivery method used for each type of project undertaken (you may select more than one delivery method):

Type of project	Delivery Method				
	DBB	DB	CM	BOT	N/A
New Roads/Streets (within cities)					
Tunnels					
Bridges					
Landscape Projects					
Beautification Projects (site development)					
Storm Drainage Projects					
Asphalting, Walkways and Lighting					
Operational and Maintenance Projects					
Other (please specify)					

2.3 Based on your experience of the implementation of DBB in municipal projects, please evaluate the impact of DBB on *COST* by selecting ONE of the following factors:

(Evaluation should be in general and not in relation to a specific project)

☐ **EXCEEDING THE PROJECT BUDGET (OVERRUN).**
If you select this option, please complete section 2.3.1 and evaluate the factors.

☐ **MEETING THE PROJECT BUDGET.**
If you select this option, please complete section 2.3.2 and evaluate the factors.

☐ **GENERATING COST SAVINGS.**
If you select this option, please complete section 2.3.3 and evaluate the factors.

2.3.1 EXCEEDING THE PROJECT BUDGET IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Variations demanded by the municipality (client)					
2	Constructability issues					
3	Occurrence of claims and disputes					
4	Design variations (changes in scope)					
5	Tight project schedule					
6	Price inflation of construction materials					
7	Inadequate program scheduling					
8	Poorly-developed plans and specifications					
9	Incomplete approval and other documents					
10	Corrective works (re-work)					
11	Extension of project duration					
12	Unsuitable construction program planning					
13	Incomplete or inaccurate cost estimates					
14	Bureaucracy of government systems					
15	Other, please specify					

2.3.2 MEETING THE PROJECT BUDGET IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Clear project scope					
2	No design changes					
3	No claims or disputes					
4	Innovative construction methods					
5	Involved parties' knowledge of DBB					
6	Accurate cost estimates					
7	Abiding by the original design scope					
8	Proper municipality supervision					
9	Contractor Experience					
10	Cooperative relationships among all parties					
11	Well-developed plans and specifications					
12	Well-developed construction program					
13	Other, please specify					

2.3.3 COST SAVINGS ARE OFTEN GENERATED AS A RESULT OF:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Applying value engineering					
2	Innovative construction methods					
3	Minimal change orders					
4	Cooperative relationships among all parties					
5	Involved parties' knowledge of DBB					
6	Proper municipality supervision					
7	Contractor construction experience					
8	Built-in incentives for cost savings					
9	Early completion of the project					
10	Adequate program scheduling					
11	Other, please specify					

2.4 Based on your experience of the implementation of DBB in municipal projects, please evaluate the impact of DBB on *TIME* by selecting ONE of the following factors:

(Evaluation should be in general and not in relation to a specific project)

☐ **EXCEEDING THE PLANNED PROJECT SCHEDULE.**
If you select this option, please complete section 2.4.1 and evaluate the factors.

☐ **MEETING THE PLANNED PROJECT SCHEDULE.**
If you select this option, please complete section 2.4.2 and evaluate the factors.

☐ **COMPLETING THE PROJECT AHEAD OF THE PLANNED SCHEDULE.**
If you select this option, please complete section 2.4.3 and evaluate the factors.

2.4.1. COMPLETING THE PROJECT LATE IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Unclear project scope					
2	Constructability issues					
3	Change orders					
4	Corrective works (re-work)					
5	Involved parties' lack of knowledge of DBB					
6	Variations demanded by municipality staff					
7	Major changes in original design					
8	Conflicts and claims					
9	Poorly-developed plans and specifications					
10	Tight project schedule					
11	High performance or quality expectations					
12	Other, please specify					

2.4.2 MEETING THE PLANNED PROJECT SCHEDULE IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Clear project scope					
2	Abiding by the original design scope					
3	Minimal design changes					
4	Proper municipality supervision					
5	Proper contractor supervision					
6	Absence of conflicts and claims					
7	Innovative construction methods					
8	Cooperative relationships among all parties					
9	Involved parties' knowledge of DBB					
10	Other, please specify					

2.4.3 COMPLETING THE PROJECT AHEAD OF SCHEDULE IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Well-developed project schedule					
2	Proper municipality supervision					
3	Innovative construction methods					
4	Proper contractor supervision					
5	Minimal change orders					
6	Built-in incentives for early completion					
7	Cooperative relationships among all parties					
8	Clear plans and specifications					
9	Involved parties' knowledge of DBB					
10	Other, please specify					

2.5 Based on your experience of the implementation of DBB in municipal projects, please evaluate the impact of DBB on *QUALITY* by selecting ONE of the following factors:

(Evaluation should be in general and not in relation to a specific project)

☐ **FAILING TO MEET PROJECT QUALITY REQUIREMENTS.**
If you select this option, please complete section 2.5.1 and evaluate the factors.

☐ **MEETING PROJECT QUALITY REQUIREMENTS.**
If you select this option, please complete section 2.5.2 and evaluate the factors.

☐ **EXCEEDING PROJECT QUALITY REQUIREMENTS.**
If you select this option, please complete section 2.5.3 and evaluate the factors.

2.5.1 FAILING TO MEET PROJECT QUALITY REQUIREMENTS IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Poorly-developed plans and specifications					
2	Poor municipality supervision and lack of experience					
3	Under-qualified contractors					
4	Variations in construction programs					
5	Change orders					
6	Insufficiency of skilled labor					
7	Unsuitable construction program planning					
8	Tight project schedule					
9	Complexity of the project					
10	High performance or quality expectations					
11	Low management competency of subcontractors					
12	Absence of a project quality program					
13	Lack of coordination between project participants					
14	Incomplete or inaccurate cost estimates					
15	Design variations					
16	Other, please specify					

2.5.2 MEETING PROJECT QUALITY REQUIREMENTS IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Applying innovative construction methods					
2	Abiding by the original design scope					
3	Minimal design changes					
4	Proper municipality supervision					
5	Proper contractor supervision					
6	Cooperative relationships among all parties					
7	Contractor Construction experience					
8	Well-developed plans and specifications					
9	Appropriate selection of subs and suppliers					
10	Other, please specify					

2.5.3 EXCEEDING PROJECT QUALITY REQUIREMENTS IS OFTEN DUE TO:

	Factor	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Applying innovative construction methods					
2	Experience of municipality construction staff					
3	No constructability issues					
4	No major changes to original design					
5	Well-developed plans and specifications					
6	Cooperative relationships among all parties					
7	Contractor Construction experience					
8	Proper communication among parties					
9	Appropriate selection of subs and suppliers					
10	Other, please specify					

2.6 From your experience with municipal projects please evaluate the extent to which you either agree or disagree with the following statements using the scale from 1 to 5 where:

1: Strongly Disagree, 2: Disagree, 3: Neutral, 4: Agree, 5: Strongly Agree

The DBB delivery method……

	Statement	Scale				
		1	2	3	4	5
1	furnishes fair competition among all contractors.					
2	discourages favoritism when spending public funds.					
3	stimulates competition in the bidding process for municipal projects.					
4	provides the lowest initial price that responsible, competitive bidders can offer.					
5	is easily understood.					
6	is widely applicable to all municipal projects.					
7	provides a well-established relationship which clearly states the roles and responsibilities of all parties involved in the project.					
8	provides the project owner (municipality) with a significant amount of control over the design of the end product.					
9	provides the project owner (municipality) with a significant amount of control over the end product during the construction process.					
10	is time-consuming.					
11	requires the owner to have technical expertise.					
12	allows the owner to have control over change orders.					
13	provides a single point of responsibility for the project.					
14	isolates the design and construction activities.					
15	tends to create adversarial relationships among the contracting parties, rather than fostering a cooperative atmosphere in which issues can be resolved efficiently and effectively					
16	results in adversarial relationships between owner, contractor and designer.					
17	encourages cooperation between all parties in the project.					
18	provides incentives for contractors to use innovative approaches to reduce project costs.					
19	provides incentives for contractors to use innovative approaches to reduce project duration.					
20	clearly defines roles for all parties.					
21	eliminates legal barriers in procurement and licensing.					
22	provides municipalities with significant control over the end product .					
23	defines clearly the required insurance and bonds.					
24	furnishes well-established legal precedents as a result of previous litigation.					
25	requires a higher level of inspection by the municipality to achieve cost containment.					
26	secures minimum quality requirements					
27	lacks input from the construction industry during the design stage.					
28	exposes the municipality to claims related to design and constructability issues					
29	lacks built-in incentives for contractors to provide enhanced performance (cost, time, quality, or combination thereof)					
30	results in the greatest potential for cost/time overrun (in comparison to other delivery methods)					
31	transfers project risk to contractors					
32	maintains the project risk with municipalities					

2.7 From your experience, please indicate the extent of the impact of the four delivery methods on the various phases of a project using the following scale:

1: No Impact, 2: Minor Impact, 3: Impact, 4: Strong Impact, 5: N/A:

Type of Delivery Method	Planning Phase					Design Phase					Bidding Phase					Construction Phase					Closeout Phase				
Design-Bid-Build ("Traditional")	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Design-Build (DB)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Construction Management (CM)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Build-Operate-Transfer (BOT)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

Considering the life cycle of a construction project, please describe the process used by the municipality when carrying out a project using DBB.

PLANNING PHASE

2.8 Who defines the need for a municipal project?

Entity	Less than 25%	25%-49%	50%-75%	More than 75%
In–house				
Outsource				
Combination				
Other, Please specify				

2.9 How do you decide on the necessity of a project? You may check more than one option.

- ☐ Resolving current problem
- ☐ New current demands
- ☐ Future vision
- ☐ Other, please specify….

2.10 Who usually conducts the project feasibility study?

Entity	Less than 25%	25%-49%	50%-75%	More than 75%
In–house				
Outsource				
Combination				
Other, Please specify				

2.11 At what stage is the project funding requested?

- ☐ Before the project scope is defined
- ☐ At 30% of defined scope
- ☐ At 60% of defined scope
- ☐ At completed defined scope

2.12 Who usually evaluates municipal project alternatives?

- ☐ Ministry of Municipalities & Rural Affairs (MOMRA)
- ☐ Designated committee within the municipality
- ☐ Construction Department manager
- ☐ Engineering department manager
- ☐ Other, please specify

DESIGN AND ENGINEERING PHASE

2.13 Who usually designs municipal projects?

Entity	Less than 25%	25%-49%	50%-75%	More than 75%
In–house (Engineering dept.)				
Outsource (contracted engineering firms)				
Combination				
Other, Please specify				

2.14 During the design, does the municipality consider design constructability?

- ☐ Yes
- ☐ No, (Go to question 2.16)

2.15 Who usually reviews the design constructability?

Entity	Less than 25%	25%-49%	50%-75%	More than 75%
In–house (Engineering dept.)				
In–house (Construction dept.)				
Outsource (engineering firm)				
Outsource (contractor firm)				
Other, Please specify				

2.16 Do you usually consider the development of the tendering (bidding) documents as part of the design package?

- ☐ Yes, (Go to question 2.18)
- ☐ No

2.17 If the answer to question 2.16 is "No", who develops the tendering documents?

- ☐ In–house (Engineering dept.)
- ☐ In–house (Construction dept.)
- ☐ In–house (Contracting dept.)
- ☐ Outsource (Consulting/Engineering firm)
- ☐ Other, please specify

TENDERING (BIDDING) PHASE

2.18 Please select the procurement system the municipality follows for DBB.

- ☐ Open bidding
- ☐ Closed bidding
- ☐ Negotiated
- ☐ Competitive Negotiated
- ☐ Other, please specify….

2.19 Who selects the contractor?

- ☐ Engineering department
- ☐ Contracting department
- ☐ Bid Awarding committee
- ☐ Municipality Mayor
- ☐ Other, please specify

CONSTRUCTION PHASE

2.20 Who usually supervises municipal projects?

Entity	Less than 25%	25%-49%	50%-75%	More than 75%
In–house (Construction dept.)				
Outsource (engineering firm)				
Outsource (contractor firm)				
Other, Please specify				

2.21 Who is the final judge on whether the project is complete as per the bid documents?

- ☐ In–house (Construction dept.)
- ☐ In–house (project manager)
- ☐ Outsource (engineering firm)
- ☐ Outsource (project manager)
- ☐ Other, please specify

SECTION 3: Main Problems and Potential Solutions

This final section seeks information relevant to the identification of the main problems that municipalities are encountering with the use of DBB delivery as mandated by the Saudi government purchasing regulations. It additionally aims to obtain, from the perspective of municipality-concerned staff, recommendations on how to address these problems in a practical fashion.

You are kindly requested to highlight the problems and possible interventions that could be considered with the use of DBB:

Problem 1:

Solutions (interventions):

Problem 2:

Solutions (interventions):

Problem 3:

Solutions (interventions):

APPENDIX II: Arabic Questionnaire

جامعة الملك فهد للبترول والمعادن

كلية تصاميم البيئة

قسم إدارة وهندسة التشييد

تقييم تأثير

الطريقة التقليدية للتعاطي في المشاريع

"التصميم-العطاء-التشييد"

على المشاريع البلدية في المملكة العربية السعودية

استبيان : نسخة باللغة العربية

الباحث : أحمد محمد أبوراس

الهاتف الجوال: 58873323 5 966+ / 05847370 5 966+

الفاكس: 8748333 3 966 +

طريقة التعاطي في المشاريع:

تعرف على أنها تركيبة العلاقة والمسئوليات بين المالك والجهة المصممة والجهة المنفذة وكذلك جميع الأطراف الأخرى التي يتوقع أن يكون لها علاقة مباشرة أوغيرمباشرة بالمشروع. إن تركيبة العلاقة مع المالك للمشروع والأنشطة المختلفة (التصميم / العطاء / التشييد) هي التي تعرف بطريقة التعاطي في المشاريع والتي بدورها قد تكون مسئولية فردية أو مزدوجة أو ثلاثية.

التصميم – العطاء - التشييد Design-Bid-Build (DBB)

تسمى طريقة (التصميم – العطاء – التشييد) أيضاً بالطريقة التقليدية للتعاطي في المشاريع وهي الطريقة المتبعة في جميع المشاريع الحكومية بالمملكة العربية السعودية وذلك حسب نظام المشتريات الحكومية. وتتمحورهذه الطريقة في وجود علاقتين قانونيتين منفصلتين مع المالك ممثلتين في عقدين منفصلين مع الطرفين الاساسيين وهما الجهة المصممة والجهة المناط بها عمليات التشييد. وهذه ستظل أشهرطريقة للتعاطي في مشاريع صناعة التشييد في العالم.

وبعبارة أخرى، هذه الطريقة تتضمن عقدين مع المالك. الجهة الأولى والتي لها عقد مع المالك تكون مسئولة عن تطويرالتصميم وكل المستندات المطلوبة للمناقصة. ويكون العقد الثاني مع المقاول (المنفذ) والذى يقوم بالتشييد الفعلي للمشروع.

التصميم - التشييد Design - Build (DB)

تعتبر طريقة (التصميم – التشييد) إحدى طرق التعاطي في المشاريع حيث يتعاقد مالك المشروع سواء كان جهة حكومية أو قطاعاً خاصاً مع جهة واحدة فقط تكون مسئولة مسئولية كاملة وقانونية تجاه المالك في القيام بجميع المهام المطلوبة من تصميم وتشييد للمشروع. فقد استخدمت طريقة التعاطي في المشاريع هذه في القديم حيث أطلق عليها مسمى "طريقة المعلم" والتي بدورها تحل كثيراً من الإشكالات التي يتهم بها طريقة (التصميم – العطاء – التشييد).

في طريقة التعاطي في المشاريع هذه تنشأ في كثير من الأحيان مشاركات بين المكاتب الهندسية والشركات الإنشائية لتكوين منشأة واحدة قادرة ومؤهلة للتقدم والمنافسة قانونياً أمام المالك للحصول على المشروع.

إدارة المشاريع Construction Management (CM)

في هذه الطريقة يفوض المالك مديراً للمنشأة بأن يكون مسئولاًعن تفاصيل ودورة المشروع لكي يفي بأهداف المالك. و تتسم هذه الطريقة بإجراء عقدين أولهما بين المالك ومديرمحترف بالتشييد (مديراً للمشروع) وثانيهما مع الجهة المنفذة للتشييد. وهناك أشكال مختلفة من المسئولية على مدير المشروع حيث تتراوح المسئولية من تقديم المشورة والمساعدة الفنية إلى تحمل المسئولية الكاملة امام المالك والتعرض للمخاطرة عند تجاوزالتكلفة والجدولة النهائية للتشييد.

تكمن فكرة إدارة المشاريع في تزويد المالك بالعناصرالمهنية والفنية المؤهلة والتي تقوم بإدارة جميع مراحل المشروع وذلك في حالة افتقار المالك لتلك الخبرة.

التشييد – التشغيل - تحول الملكية (BOT)

هي طريقة أخرى للتعاطي في المشاريع ذات كينونة خاصة ومتفردة كأنموذج لاتحاد شركات خاصة وتكون ذات مسئولية قانونية مالياً لكل أو بعض المهام ذات الصلة بالمشروع وهي عبارة عن نظام تعاطي في المشاريع وموارد مالية حيث أن الكفيل أو الضامن الخاص يكون مسئولاًعن تمويل التصميم وتشييد و تشغيل المشروع لفترة محددة من الزمن تسمى (فترة امتياز) لكي يتمكن من تحصيل دخل أو ريع المشروع بعد تسوية المصروفات وتحقيق الارباح. بعد فترة الامتياز تؤول ملكية المنشأة للسلطات الحكومية.

القسم الأول: معلومات عامة عن الأمانات والمشاركين في الاستبيان

يختص هذا القسم بجمع المعلومات الأساسية لمعرفة الأمانات والأفراد المكلفين بإكمال الاستبيان.

نرجو إكمال هذا الجزء بوضع العلامة (✓) على الاختيار المناسب أو كتابة المعلومات الصحيحة في المكان المخصص لذلك. كما نرجو أن تكون الإجابات انعكاساً حقيقياً للممارسات الفعلية في الأمانة.

كل المعلومات سوف تعامل بدرجة عالية من السرية

1.1 معلومات المشارك في الاستبيان:

الاسم (اختياري)	
الإدارة	
مسمى الوظيفة	
البريد الإلكتروني	
رقم التلفون	
رقم الفاكس	

1.2 ما هو مستواك التعليمي ومجال التخصص؟

☐ دكتوراة (مجال التخصص)

.....

☐ ماجستير (مجال التخصص)

.....

☐ بكالريوس (مجال التخصص)

.....

☐ أي درجة أخري (اذكرها)

.....

1.3 ما هي الأمانة التي تمثلها؟

☐ الرياض	☐ مكة المكرمة	☐ جدة	☐ المدينة المنورة
☐ المنطقة الشرقية	☐ الطائف	☐ الأحساء	☐ القصيم
☐ عسير	☐ حائل	☐ الباحة	☐ تبوك
☐ جازان	☐ نجران	☐ الجوف	☐ الحدود الشمالية

1.4 ما هو عدد البلديات الفرعية التي تشرف عليها الأمانة حالياً؟

.....

1.5 ما هو عدد سنين خبرتك في مشاريع الأمانات (البلديات)؟

☐ أقل من 5 سنوات ☐ 5 و أقل من 10 سنوات ☐ 10 وأقل من 15سنة

☐ 15 و أقل من 20 سنة ☐ 20 و أقل من 25 سنة ☐ 25 سنة فأكثر

1.6 هل لديك خبرة بالطرق المعروفة للتعاطي في المشاريع: DBB (تصميم-العطاء-التشييد) او DB (التصميم-التشييد) او CM (ادارة المشاريع) او BOT (التشييد-التشغيل-تحول الملكية)؟

☐ نعم.

☐ لا (نرجو الإجابة على القسم الثاني السؤال 2.1)

1.7 نرجو تقييم معرفتك بالطرق التالية للتعاطي في المشاريع باستخدام المقياس التالي:

1: لا أعرف عنها شيئاً; 2: معرفة قليلة ; 3: معرفة متوسطة ; 4 : معرفة فائقة; 5 : خبير

طريقة التعاطي في المشاريع	المقياس				
	1	2	3	4	5
التصميم-العطاء-التشييد "الطريقة التقليدية" (DBB)					
التصميم – التشييد (DB)					
إدارة الإنشاءات (CM)					
التشييد – التشغيل – تحول الملكية (BOT)					
أخرى (نرجو التحديد)					

1.8 ما هو عدد سنين الخبرة لديك بطرق التعاطي في المشاريع؟ نرجو وضع علامة (✓) في المكان المناسب:

طريقة التعاطي في المشاريع	أقل من 5 سنوات	5 – أقل من 10 سنوات	10 – أقل من 15 سنه	15 – أقل من 20 سنة	20 – أقل من 25 سنة	25 سنة فأكثر
التصميم-العطاء-التشييد "الطريقة التقليدية" (DBB)						
التصميم – التشييد (DB)						
إدارة الإنشاءات (CM)						
التشييد – التشغيل – تحول الملكية (BOT)						
أخرى (نرجو التحديد)						

1.9 ما هو عدد المشاريع التي قمتم بإنجازها خلال الخمس سنوات الماضية معتمدين على الطرق التالية؟

طريقة التعاطي في المشاريع	عدد المشاريع
التصميم-العطاء-التشييد "الطريقة التقليدية" (DBB)	
التصميم – التشييد (DB)	
إدارة الإنشاءات (CM)	
التشييد – التشغيل – تحول الملكية (BOT)	
أخرى (نرجو التحديد)	

1.10 من خلال خبرتكم بمشاريع الأمانة المنفذة, الرجاء تحديد النسبة المئوية لكل من الطرق المستخدمة في هذه المشاريع:

طريقة التعاطي في المشاريع	النسبة المئوية(%)
التصميم-العطاء-التشييد "الطريقة التقليدية" (DBB)	
التصميم – التشييد (DB)	
إدارة الإنشاءات (CM)	
التشييد – التشغيل – تحول الملكية (BOT)	
أخرى (نرجو التحديد)	
المجموع	**100**

القسم الثاني: تطوير المشاريع بطريقة (التصميم-العطاء-التشييد) DBB

هذا القسم يبحث عن المعلومات ذات الصلة بطبيعة المشاريع التي تم تنفيذها بواسطة الأمانات (البلديات) التي تمثلها وكذلك الأساليب المتبعة في تنفيذ هذه المشاريع ومن ثم المشاكل التي واجهتموها آخذين في الاعتبار المعايير الثلاثة (زمن التنفيذ، تكلفة التنفيذ، جودة التنفيذ) لتقييم أداء المشاريع. وكذلك بناءً على خبرتك، نرجو تحديد مدى قوة و ضعف هذه الطريقة بالنسبة للمشاريع البلدية.

2.1 نرجو تحديد النسبة المئوية لكل نوع من المشاريع البلدية التالية والتي قمتم بتنفيذها (إنجازها)

نوع المشروع	النسبة المئوية (%)
مشاريع طرق جديدة / شوارع داخل المدن (New Roads/Streets within City)	
مشاريع أنفاق (Tunnels Projects)	
مشاريع كباري (Bridges Projects)	
مشاريع التشجير والري (Landscape Projects)	
مشاريع التجميل وتطوير المواقع (Beautification Projects and Site Development)	
مشاريع تصريف مياه الأمطار (Storm Drainage Projects)	
مشاريع سفلتة، ممرات وإنارة (Asphalting, Walkways and Lighting Projects)	
مشاريع تشغيلية وصيانة (Operational and Maintenance Projects)	
أي مشاريع آخري (أذكرها)	
المجموع	**100%**

2.2 نرجو وضع علامة (✓) أمام نوع طريقة التعاطي في المشاريع التي استخدمت في كل من المشاريع التالية:

نوع المشروع	طريقة التعاطي في المشاريع				
	DBB	DB	CM	BOT	N/A
مشاريع طرق جديدة / شوارع داخل المدن (New Roads/Streets within City)					
مشاريع أنفاق (Tunnels Projects)					
مشاريع كباري (Bridges Projects)					
مشاريع التشجير والري (Landscape Projects)					
مشاريع التجميل وتطوير المواقع (Beautification Projects and Site Development)					
مشاريع تصريف مياه الأمطار (Storm Drainage Projects)					
مشاريع سفلتة، ممرات وإنارة (Asphalting, Walkways and Lighting Projects)					
مشاريع تشغيلية وصيانة (Operational and Maintenance Projects)					
أي مشاريع آخري (أذكرها)					

2.3 من خلال خبرتك في تطبيق طريقة (DBB) لإنجاز المشاريع البلدية، نرجو تقييم أثر هذه الطريقة على تكلفة المشروع وذلك باختيارأحد الخيارات التالية:

(نرجو ان يكون التقييم في الغالب وليس لمشروع بعينه)

☐ تجاوز الميزانية للمشروع. الرجاء الانتقال إلى الفقرة 2.3.1

☐ مطابقة الميزانية المحدودة للمشروع. الرجاء الانتقال إلى الفقرة 2.3.2

☐ إنجاز المشروع بأقل من التكلفة المحددة له. الرجاء الانتقال إلى الفقرة 2.3.3

2.3.1 سبب تجاوز ميزانية المشروع غالباً ما يرجع إلي أحد العوامل التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	اوافق بشدة	اوافق	محايد	لا اوافق	لا اوافق بشدة
1	بعض التغيرات التي طرأت من جانب الأمانة (البلدية)					
2	أمور إنشائية متعلقة بقابلية التشييد					
3	حدوث الإدعاءات والتنازعات					
4	تغيرات في التصميم (تغيير هدف المشروع)					
5	ضيق جدولة تنفيذ المشروع					
6	تضخم أسعار مواد التشييد					
7	عدم كفاية الجدول الزمني لتنفيذ المشروع					
8	عدم الإعداد الجيد لخرائط ومواصفات المشروع					
9	عدم اكتمال الموافقات والمستندات المطلوبة					
10	الحاجة لتصحيح بعض الأخطاء في العمل المنجز (إعادة العمل)					
11	تمديد الفترة الزمنية لتنفيذ المشروع					
12	عدم استخدام الخطط الإنشائية المناسبة للمشروع					
13	نقص أو عدم الدقة في تقدير التكلفة الأساسية للمشروع					
14	رتابة النظم البيروقراطية من قبل الإدارت الحكومية					
15	أي عامل آخر (أذكره)					

2.3.2 مطابقة الميزانية المحدودة للمشروع وذلك للعوامل التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	اوافق بشدة	اوافق	محايد	لا اوافق	لا اوافق بشدة
1	وضوح هدف المشروع					
2	عدم التغيير في التصاميم أثناء التنفيذ					
3	عدم وجود ادعاءات أو تنازعات					
4	تطبيق أساليب إنشائية مبتكرة					
5	الإلمام الجيد للأطراف المشاركة بطريقة DBB					
6	تقدير دقيق لتكلفة المشروع الأساسية					
7	التقيد بالتصميم الأصلي للمشروع					
8	الإشراف الجيد من قبل الأمانة					
9	خبرة المقاول					
10	تعاون جميع الأطراف المشاركة في المشروع					
11	جودة الخرائط والمواصفات المعدة للمشروع					
12	البرنامج المعد جيداً للإنشاء					
13	أي عامل آخر (اذكره)					

2.3.3 إنجاز المشروع بأقل من التكلفة المعدة وذلك نتيجة للأسباب التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	اوافق بشدة	اوافق	محايد	لا اوافق	لا اوافق بشدة
1	تطبيق الهندسة القيمية					
2	تطبيق أساليب إنشائية مبتكرة					
3	قلة أوامر التغيير					
4	علاقة تعاونية بين جميع الأطراف المشاركة في المشروع					
5	الإلمام الجيد لجميع الأطراف المشاركة بطريقة (DBB)					
6	الإشراف المناسب من قبل الأمانة					
7	خبرة المنفذ (المقاول) بالإنشاءات					
8	تحفيز ذاتي على التوفير في تكلفة المشاريع					
9	اكتمال المشروع قبل الموعد المحدد مسبقاً					
10	جدول زمني وافٍ للمشروع					
11	اي عامل آخر (اذكره)					

2.4 من خلال خبرتك بتطبيق طريقة (DBB) لإنجاز المشاريع البلدية، نرجو تقييم أثر هذه الطريقة على الزمن وذلك باختيارأحد الخيارات التالية:

(نرجو ان يكون التقييم في الغالب وليس لمشروع بعينه)

☐ تجاوز الجدول الزمني للمشروع. اذا اخترت هذا الخيار نرجو الانتقال إلى الفقرة 2.4.1

☐ إكمال المشروع في الزمن المحدد له . اذا اخترت هذا الخيار نرجو الانتقال إلى الفقرة 2.4.2

☐ إكمال المشروع قبل الزمن المحدد له. اذا اخترت هذا الخيار نرجو الانتقال إلى الفقرة 2.4.3

2.4.1 عادة ما يكون إكمال المشروع متأخراً عن الجدول الزمني للأسباب التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	عدم وضوح هدف المشروع					
2	أمور إنشائية متعلقة بقابلية التشييد					
3	أوامر التغيير					
4	أعمال تصحيحية					
5	عدم الإلمام الجيد لجميع الأطراف المشاركة بطريقة (DBB)					
6	تغييرات طفيفة من قبل الأمانة					
7	تغيير أساسي في التصميم الأصلي					
8	وجود إدعاءات أو منازعات					
9	عدم جودة الخرائط والمواصفات المعدة للمشروع					
10	ضيق جدولة تنفيذ المشروع					
11	وضع توقعات عالية للأداء وجودة التشييد					
12	أي عامل آخر (نرجو ذكره)					

2.4.2 عادة ما يكون إنجاز المشروع في نطاق الجدول الزمني وذلك للأسباب التالية :

نرجو وضع علامة (✓) أمام المكان المناسب

	العامل	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	وضوح هدف المشروع					
2	التقيد بالتصميم الأصلي لهدف المشروع					
3	تغييرات طفيفة في التصميم					
4	الإشراف المناسب من قبل الأمانة					
5	الإشراف المناسب من قبل المنفذ (المقاول)					
6	عدم وجود إدعاءات أو منازعات					
7	تطبيق طرق إنشائية مبتكرة					
8	علاقة تعاونية بين جميع الأطراف المشاركة في المشروع					
9	الإلمام الجيد لجميع الأطراف المشاركة بطريقة (DBB)					
10	أي عامل آخر (نرجو ذكره)					

2.4.3 عادة ما يكون إكمال المشروع قبل الجدول الزمني المحدد له وذلك للأسباب التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	وجود جدول زمني معد جيداً للمشروع					
2	الإشراف المناسب من قبل الأمانة					
3	تطبيق أساليب إنشائية مبتكرة					
4	الإشراف المناسب من قبل المنفذ (المقاول)					
5	قلة او عدم أوامر التغيير					
6	وجود محفزات لإكمال المشروع قبل الموعد المحدد له					
7	علاقة تعاونية بين جميع الأطراف المشاركة في المشروع					
8	وضوح وجودة الخرائط والمواصفات المعدة للمشروع					
9	الإلمام الجيد لجميع الأطراف المشاركة بطريقة (DBB)					
10	أي عامل آخر (نرجو ذكره)					

2.5 من خلال خبرتك بتطبيق طريقة (DBB) لإنجاز المشاريع البلدية، نرجو تقييم أثر هذه الطريقة على الجودة وذلك باختيارأحد الخيارات التالية:

(نرجو ان يكون التقييم في الغالب وليس لمشروع بعينه)

☐ الإخفاق في إنجاز المشروع طبقاً لمواصفات الجودة المعدة له. إذا اخترت هذا الخيار نرجو الانتقال إلى الفقرة 2.5.1

☐ إنجاز المشروع طبقاً لمواصفات الجودة المعدة له. اذا اخترت هذا الخيار نرجو الانتقال إلى الفقرة 2.5.2

☐ إنجاز المشروع بمواصفات تفوق الجودة المعدة له. اذا اخترت هذا الخيار نرجو الانتقال إلى الفقرة 2.5.3

2.5.1 عادة ما يكون الإخفاق في جودة إنجاز المشروع حسب المواصفات المطلوبة وذلك للعوامل التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	عدم الإعداد الجيد لخرائط ومواصفات المشروع					
2	الإشراف غير الجيد على المشروع من قبل الأمانة					
3	عدم كفاءة المنفذ (المقاول)					
4	التغيير في أهداف التشييد					
5	كثرة أوامر التغيير					
6	عدم توفر العمالة الماهرة					
7	التخطيط غير المناسب للتشييد					
8	ضيق جدولة تنفيذ المشروع					
9	درجة صعوبة تنفيذ المشروع					
10	وضع توقعات عالية لأداء وجودة التشييد					
11	عدم كفاءة الأداء للمقاولين الفرعيين					
12	عدم وجود برنامج لجودة التنفيذ					
13	عدم التنسيق بين الأطراف المشاركة في المشروع					
14	عدم الدقة في تقديرتكلفة المشروع					
15	تغييرات في التصميم					
16	أي عامل آخر (نرجو ذكره)					

2.5.2 عادة ما تكون جودة إنجاز المشروع طبقاً للمواصفات المطلوبة وذلك للعوامل التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	تطبيق طرق إنشائية مبتكرة					
2	التقيد بالتصميم الأصلى لهدف المشروع					
3	تغييرات طفيفة في التصميم					
4	الإشراف المناسب من قبل الأمانة					
5	الإشراف المناسب من قبل المنفذ (المقاول)					
6	علاقة تعاونية بين جميع الأطراف المشاركة في المشروع					
7	خبرة المنفذ (المقاول) بالإنشاءات					
8	وضوح وجودة الخرائط والمواصفات المعدة للمشروع					
9	الاختيار المناسب للمقاولين الفرعيين وجميع الجهات الموفرة للعمالة والمواد					
10	أي عامل آخر (نرجو ذكره)					

2.5.3 عادة ما تفوق جودة المشروع المواصفات المطلوبة وذلك للعوامل التالية:

نرجو وضع علامة (✓) أمام المكان المناسب:

	العامل	أوافق بشدة	أوافق	محايد	لا أوافق	لا أوافق بشدة
1	تطبيق طرق إنشائية مبتكرة					
2	خبرة موظفي التشييد (المشاريع) بالأمانة					
3	قابلية المشروع للتشييد					
4	عدم وجود تغيير أساسي في التصميم الأصلي					
5	وضوح وجودة الخرائط والمواصفات المعدة للمشروع					
6	علاقة تعاونية بين جميع الأطراف المشاركة في المشروع					
7	خبرة المنفذ (المقاول) بالإنشاءات					
8	تواصل جيد بين الأطراف المشاركة في المشروع					
9	الاختيار المناسب للمقاولين الفرعيين وجميع الجهات الموفرة للعمالة والمواد					
10	أي عامل آخر (نرجو ذكره)					

2.6 من خلال خبرتك في مشاريع الأمانة ، نرجو تقييم مدى موافقتك للعبارات التالية وذلك باتباع المقياس التالي:

(1: لا أوافق بشدة ; 2: لا أوافق ; 3: محايد ; 4: أوافق ; 5: أوافق بشدة)

طريقة DBB للتعاطي في المشاريع عادة ما:

	العبارة	المقياس				
		1	2	3	4	5
1	تضمن فرصة المنافسة العادلة بين كل المنفذين (المقاولين) المتقدمين للحصول على المشروع					
2	تضمن الحيادية في ترسية المشاريع على المنفذ (المقاول) الأكفأ والمحافظة في صرف المال العام					
3	تشجع المنافسة في مرحلة طرح العطاء (المناقصة)					
4	تضمن تقديم أقل سعر مبدئي لتنفيذ المشروع من قبل المنفذين (المقاولين) المؤهلين					
5	تكون سهلة الفهم					
6	يمكن تطبيقها في كل مشاريع الأمانة					
7	توفر علاقة متينة حيث أنها توضح الأدوار والمسئوليات بين جميع الأطراف المشتركة في المشروع					
8	تقدم لصاحب المشروع (الأمانة) فرصة التحكم والسيطرة الكاملة على التصميم النهائي للمشروع					
9	تقدم لصاحب المشروع (الأمانة) فرصة التحكم والسيطرة الكاملة على المشروع أثناء مرحلة التشييد					
10	تستغرق مدة زمنية أطول لاستكمال جميع مراحل المشروع (التصميم – العطاء – التشييد)					
11	تتطلب وجود خبرة فنية كافية بالمشاريع لدى مالك المشروع (الأمانة)					
12	تسمح لمالك المشروع بالتحكم فى أوامر التغيير					
13	تحدد مرجعية واحدة للمسئولية عن المشروع أمام المالك					
14	تفصل بين مرحلتي التصميم والتشييد					
15	تخلق علاقة غير تعاونية بين جميع الأطراف المتعاقدة بدلاً عن خلق جو تعاوني يكفل حل المنازعات بصورة فاعلة ومؤثرة					
16	ينتج عنها علاقة غير تعاونية بين جميع الأطراف المشاركة في المشروع (المالك والمقاول والمصمم)					
17	تشجع على التعاون بين كل الأطراف المشتركة في المشروع (المالك والمقاول والمصمم)					
18	توفر حوافز للمنفذين (المقاولين) لاستخدام طرق مبتكرة لتقليل التكلفة					
19	توفر حوافز للمنفذين (المقاولين) لاستخدام طرق مبتكرة لتوفير الزمن					
20	تعرف أدوار كل المشاركين في المشروع (المالك والمقاول والمصمم) بوضوح					
21	تزيل العوائق القانونية في الحصول على الترخيص ومتطلبات المشتريات (ترسية العطاء وغيرها)					
22	تضمن للأمانات قدراً كافياً من التحكم في المنتج النهائي (المشروع المنفذ)					
23	تشرح وتعرف الضمانات و التأمينات المطلوبة للمشروع بوضوح					
24	تعتبر طريقة واضحة قانونياً وذلك استناداً على التجارب السابقة المستفادة من استخدامها في التعاطي مع المشاريع					
25	تحتاج إلي إشراف مباشر ودقيق من قبل المسئولين المعنيين في الأمانة وذلك تحقيقاً لاحتواء التكلفة النهائية للمشروع					
26	تضمن الحصول على أقل قدر من المواصفات والجودة المطلوب تحقيقها للمشروع					
27	لا تأخذ في الاعتبار النواحي الإنشائية العملية خلال مرحلة التصميم للمشروع					
28	تضع المالك (الأمانة) في موقع المسؤولية الكاملة عن جميع الأخطاء الناتجة عن التصميم وقابلية تنفيذه					
29	لاتضمن توفير الحوافز للمقاولين على الأداء المميز من حيث تحقيق أقل التكاليف في أقصر زمن ممكن وبجودة عالية					
30	ينتج عنها غالباً زيادة التكلفة وطول زمن التنفيذ للمشروع مقارنة بالطرق (DB / CM / BOT) الأخرى					
31	تنقل مخاطرة المشروع من المالك إلي المنفذ (المقاول)					
32	تبقي المخاطرة بالمشروع مع الأمانات					

2.7 من خلال خبرتك في المشاريع البلدية، نرجو توضيح مدى تأثير طريقة التعاطي في المشاريع على المراحل المختلفة للمشاريع مستخدماً المقياس التالي:

(1: لا تأثير ; 2: تأثير طفيف ; 3: تأثير عادي ; 4: تأثير قوي ; 5: لا ينطبق)

	مرحلة التخطيط					مرحلة التصميم					مرحلة العطاءات					مرحلة التشييد					مرحلة إنهاء المشروع				
التصميم-العطاء-التشييد "الطريقة التقليدية" (DBB)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
التصميم – التشييد (DB)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
إدارة الإنشاءات (CM)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
التشييد – التشغيل – تحول الملكية (BOT)	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5

آخذاً في الاعتبار المراحل المختلفة لأي مشروع, الرجاء توضيح الطريقة التي تستخدمها الأمانة عند تنفيذ المشروع باتباع الطريقة التقليدية (التصميم – العطاء- التنفيذ)

مرحلة التخطيط

2.8 من يقوم بتحديد الحاجة لمشروع الأمانة؟

الجهة	أقل من 25%	25% - 49%	50% - 74%	75% فما فوق
إدارات الأمانة المختصة				
مصدر آخر خارجي				
المشاركة بين الأمانة ومصدر خارجي				
جهة أخرى (نرجو ذكرها)				

2.9 كيف يتم تحديد الاحتياج للمشروع؟ يمكنكم وضع (✓) على أكثر من اختيار.

- ☐ لحل مشكلة حالية
- ☐ لاحتياجات مستجدة
- ☐ نظرة مستقبلية
- ☐ أخرى (نرجو تحديدها)

2.10 في المعتاد من يقوم بدراسة جدوى المشروع؟

الجهة	أقل من 25%	25% - 49%	50% - 74%	75% فأكثر
إدارات الأمانة المختصة				
مصدر خارجي اخر				
المشاركة بين الأمانة ومصدر خارجي				
أخرى (نرجو تحديدها)				

2.11 في اي مرحلة يطلب تمويل المشروع؟

- ☐ قبل معرفة هدف المشروع
- ☐ عند 30% من تعريف هدف المشروع
- ☐ عند 60% من تعريف هدف المشروع
- ☐ عند اكتمال تعريف هدف المشروع

2.12 في المعتاد ما هي الجهة التي تقوم بتقييم الخيارات المقدمة لمشاريع الأمانة؟

- ☐ وزارة الشئون البلدية و القروية
- ☐ لجنة مختصة بالمشاريع الإنشائية في الأمانة
- ☐ مدير إدارة المنشآت
- ☐ مدير الإدارة الهندسية
- ☐ جهة أخرى (نرجو تحديدها)

مرحلة التصميم والهندسة

2.13 عادة من يقوم بتصميم مشاريع الأمانات؟

الجهة	أقل من25%	25% - 49%	50% - 74%	75% فأكثر
من خلال الأمانة (الإدارة الهندسية)				
من خلال مصدر خارجي (مكتب هندسي / استشاري)				
مشاركة (الأمانة ومكتب هندسي / استشاري)				
أخرى (نرجو تحديدها)				

2.14 في مرحلة التصميم - هل تأخذ الأمانة في الاعتبار إمكانية تنفيذ المشروع؟

☐ نعم

☐ لا (نرجو الانتقال إلى الفقرة 2.16)

2.15 عادة من هي الجهة التي تراجع إمكانية تنفيذ التصميم؟

الجهة	أقل من 25%	25% - 49%	50% - 74%	75% فأكثر
من خلال الأمانة (الإدارة الهندسية)				
من خلال الأمانة (إدارة المشاريع)				
من خلال مصدر خارجي (مؤسسة هندسية)				
من خلال مصدر خارجي (مؤسسة مقاول)				
جهة أخرى (اذكرها)				

2.16 هل من المعتاد أن يؤخذ في الاعتبار إعداد المستندات الخاصة بالعطاء كجزء أساسي من المستندات الكاملة الخاصة بتصميم المشروع؟

☐ نعم (نرجو الانتقال إلى الفقرة 2.18)

☐ لا

2.17 إذا كانت الإجابة ب "لا" في الفقرة 2.16 فما هي الجهة التي تقوم بإعداد مستندات العطاء؟

- ☐ من خلال الأمانة (الإدارة الهندسية)
- ☐ من خلال الأمانة (إدارة المشاريع)
- ☐ محلي (إدارة العقود)
- ☐ مصدر خارجي (مكتب هندسي / استشاري)
- ☐ مصدر آخر (اذكره)

مرحلة العطاء (المناقصة)

2.18 ما هو النظام الذي تتبعه الأمانة في اختيار طريقة " التصميم-العطاء-التشييد" DBB ؟

- ☐ مناقصة مفتوحة
- ☐ مناقصة مغلقة
- ☐ تفاوضية
- ☐ تفاوضية تنافسية
- ☐ طريقة أخرى (نرجو ذكرها).....

2.19 ما هي الجهة المسئولة في الأمانة التي تقوم باختيار المقاول المنفذ للمشروع؟

- ☐ الأمانة (الإدارة الهندسية)
- ☐ الأمانة (إدارة العقود)
- ☐ الأمانة (لجنة مخصصة بترسية المناقصات)
- ☐ الأمين
- ☐ جهة أخرى (نرجو ذكرها) .....

مرحلة التشييد

2.20 ما هي الجهة النهائية التي تشرف على مشاريع الأمانة عادة؟

الجهة	أقل من 25%	25% - 49%	50% - 75%	أكثر من 75%
محلي (دائرة المنشآت)				
مصدر خارجي (مؤسسة هندسية)				
مصدر خارجي (مؤسسة تعاقدية)				
جهة أخرى (نرجو ذكرها)				

2.21 ما هي الجهة النهائية التي تحكم باكتمال المشروع استناداً إلى مستندات المناقصة؟

- ☐ الأمانة (إدارة المنشآت)
- ☐ الأمانة (مدير المشروع)
- ☐ مصدر خارجي (مكتب هندسي/ استشاري)
- ☐ مصدر خارجي (مدير مشروع مكلف)
- ☐ جهة أخرى (نرجو ذكرها) .....

القسم الثالث: المشاكل الرئيسية والحلول المقترحة

يبحث هذا القسم عن المعلومات المتعلقة بالمشاكل والعوائق الرئيسية التي تواجهها الأمانات عنداستخدام الطريقة التقليدية "التصميم-العطاء-التشييد" (DBB) طبقاً لقانون المشتريات بالمملكة العربية السعودية. كما يهدف أيضا إلي الحصول على توصياتكم في ما يختص بإيجاد حلول عملية لهذه المعوقات:

العائق الاول :

الحلول المقترحة:

العائق الثاني :

الحلول المقترحة:

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